

FRIDAY, APRIL 5, 1901.

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Contributions

The Atchison Draft Gear Tests.

Chicago, March 31, 1901.

TO THE EDITOR OF THE RAILROAD GAZETTE.

Since my official report of the road tests of double-spring draft riggings on the Chicago Division of the Santa Fe was published in part in the *Railroad Gazette* of Feb. 22, I have received a number of inquiries as to what make of tandem draft rigging was used in the tests. The name of this draft rigging was omitted without my knowledge and without the approval of the Santa Fe officials, and it is only fair to the manufacturer of this draft rigging to state that it was the "Miner tandem," and that it did not suffer in any way during the tests.

EDWARD GRAFSTROM,
Mechanical Engineer, Santa Fe.

For the Yard Committee, Am. Ry. E. and M. W. Association.

New York, April 1.

TO THE EDITOR OF THE RAILROAD GAZETTE.

A draughtsman in lettering a track plan gave it this title: "Plan of proposed 'yard' at Nowhereville," and designated the several parts of the plan as follows: (1) Receiving tracks, (2) classification tracks, (3) storage tracks, (4) thoroughfare tracks, (5) departure tracks, and (6) locomotive "yard," this latter designation being applied collectively to a coaling station, turntable, ashpit and engine house, and their connecting tracks. Will some of the gentlemen who have recently tried to get up a nomenclature of yard work tell us how a repetition of the word "yard" can be avoided in the foregoing lettering, without making the designations less clear to the understanding of the average railroad man than they are now?

SHOEMAKER.

Mechanical Apprentices for Railroads.

Central of Georgia Railway Company, Savannah, Ga., March 25, 1901.

TO THE EDITOR OF THE RAILROAD GAZETTE.

I have read with much interest in your issue of March 8, 1901, the "Personnel, Material and Methods of a Railroad," by Mr. L. F. Loree, Fourth Vice-President Pennsylvania Lines West. I am sure much will be accomplished by publishing Mr. Loree's article. It is so sound and thoroughly practical it will without doubt be approved and applied by those engaged in practical railroad work. He outlines true discipline.

It has been the purpose of the system with which I am connected to work on lines similar in many respects. We carry the training in our Mechanical Department a little further than I have noticed touched upon, which we have found from several years' practice to work successfully. Apprentices for the machine shops are carefully selected, considering adaptability from physical, educational and moral standpoints. When passing the examinations on the above lines they are placed on six months' trial. If, at the end of such time, they prove themselves in every way suitable they are apprenticed for four years in the machine shop, with the first six

months of the fourth year through the draughting department, the last six months in the erecting shop, after which they are placed upon a locomotive as fireman and continued as apprentices for the position of engineers. We have several who have passed through this routine and are rendering satisfactory service. An advantage in the above practice is the improvement in the personnel; also, when business fluctuates, being able to use the men either in the shops or on the road and reducing the number of extra men, drawing from the shops when the power is engaged in moving business. It also obviates the dangers incident to employment of strangers. A copy of our apprentice contract is attached for your information.

THEO. D. KLINE,
General Superintendent.

How to Study the History of a Rail.

Niles, Mich., March 18, 1901.

TO THE EDITOR OF THE RAILROAD GAZETTE.

In your issue of the 8th inst. you described under the head of "How to Study the History of a Rail" a method proposed by Mr. Baldwin for obtaining a section of the rail while in the track. Mr. Trimble, of the Pennsylvania, at the recent meeting of the American Railway Engineering and Maintenance of Way Association described a similar method. The following method which I have used successfully may not be new, but it seems so much simpler than those referred to above that I submit it to you.

A mold such as is shown in Figs. 1 and 2 is made of soft pine so as to fit over a new section of rail. This is clamped over the rail whose section we wish to determine, and plaster of paris is then poured and allowed to set. The casts, when removed from the mold, are then placed against a thin piece of new rail of same section as that measured, but with the head removed, and the head of the desired rail is then traced as shown in Fig. 3. The accuracy of this tracing depends upon whether or not there has been any change in the dimensions of the web and base. Under ordinary conditions these will not be different from the new section. When this is suspected the web and base can be calipered and a correction made when making the drawing, or a mold can be made so as to permit the taking of a cast of the entire rail.

In order that the plaster of paris shall not cleave to

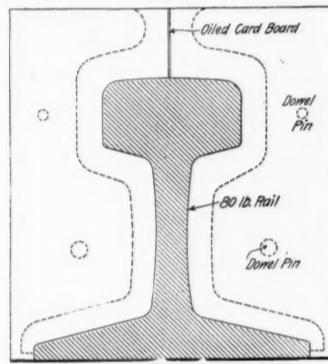


Fig. 1.

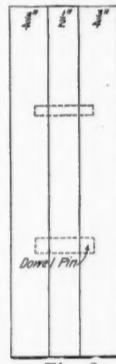


Fig. 2.

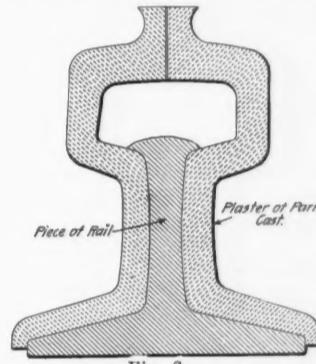


Fig. 3.

Device for Taking the Profile of Worn Rails.

the mold or rail, the inside of the mold should be varnished and the rail, after being thoroughly cleaned, should be oiled. The plaster should be of good quality, what is known as dental plaster. It should be mixed thin and thoroughly beaten so that all the air may be removed; it is then poured the same as molten metal. The openings which exist between the rail and the mold are closed with putty or moistened clay, so that the plaster may not escape.

F. A. BRYAN,
Assistant Engineer, Michigan Central.

The Rail Joint Devil.

New York, March 28.

TO THE EDITOR OF THE RAILROAD GAZETTE.

It is an old saying "That needs must when the devil drives," and it is refreshing to find the rail-splice devil is now having so much attention paid to him. The prodigious increase of rolling stock weights and speeds has fairly driven railroad officials into taking up the rail-splice question, which no form of the old-time angle bar now satisfactorily answers.

It is very gratifying that so experienced a man in maintenance of way matters as Mr. M. W. Thomson, formerly Principal Assistant Engineer Pennsylvania R. R., should have taken this question up and struck out on common sense lines. In his letter to your paper of March 8 he states the indisputable fact "that the splicing structure which joins the ends of the rails must have practically the same strength and resilience as the rail itself," and shows that the standard angle bars having only 35 per cent. the strength of the rail, if replaced with full-strength joints, *lighter rails* could be used, and a "better track and cheaper maintenance could be unquestionably attained." Mr. Thomson recognizes that splice joints are after all but so many little bridges spanning the interval between ties, and must be as strong as the parts they serve to connect. Could this be secured such a joint becomes a "100 per cent. joint," instead of a "35 per cent. joint," as now mostly in use,

and no more track labor would be required at the joint than that at any other part of the rail. Apart from accidents due to breaks at the splices, which the full-strength joint will almost entirely eliminate, the above accomplishment, could it be attained, would become one of enormous economy which must be manifest when one realizes that 50 per cent. of the track labor is concentrated at the joints, and that rail renewals are compelled more often by battered out ends, than failure in the body of the rail. Of all maintenance of way expenses about one-half is for materials and one-half for labor, and of the labor half, *one-half is at the joints*. Some authorities put the track labor as high as 70 per cent. of maintenance of way labor charges, so that the above statement is probably much under the truth. I am advised that on important trunk lines the rail renewals cost about 8 per cent. of the total maintenance of way expenses, a great deal of which would be unnecessary with a perfect joint. It is very evident that a substantial part of a dividend lies buried, and is being buried daily, by the use of the angle bar splice of most of the railroads of the country. A monument should be erected to any man that not only makes the above facts manifest to the full realization of the custodians of our railroads, but shows a practical way of correcting the evils so strangely neglected by many high officials.

Mr. Thomson has come pretty near solving the problem in his rational treatment of this most important railroad question, but he has not gone far enough. If he had gone one step further he would have done the trick. But in attempting to put his correct theory into practice to attain the needed girder depth he abruptly cuts away his depressed flanges from the bearings, and does not increase his tie support.

What seems to me a serious defect in Mr. Thomson's splice has been very cleverly avoided by Mr. A. Bonzano, a gentleman for a third of a century well known in the bridge-building world, who, with a full knowledge of the die forging capacities of steel plates, has actually out-Thomsonized Thomson, and produced a truly "hundred per cent. joint," which actual tests have confirmed. By die forging the plate to get the depth at the center of the little bridge span, he brings up the bending strain continuously on an easy curve to the bearings, and spreads out the lateral support sufficiently to take two spikes on either side of the rail, thus holding them firmly in line. In the eyes of a bridge builder this joint seems to be as ideally perfect as the limitations of the problem

permit. I await with great interest the economic record of this Bonzano joint, now being made, I understand, on several lines, as the principles on which it is based are so sound and the manufacture so simple that it seems to me the *ne plus ultra* of the long-desired rail joint. I think Mr. Thomson must admit that Mr. Bonzano has "seen him and gone him one better."

ALFRED P. BOLLER.

[The latest statistical report of the Interstate Commerce Commission gives the total expenditure for maintenance of way and structures for 1899 as \$169,825,000; for repair of road and renewals of rails and ties, \$121,697,000. The wages paid out to section foremen and other trackmen were \$79,264,000. From these figures the reader may draw such deductions as he can.—EDITOR.]

The Marine Steam Turbine.

We printed, p. 204, March 22 a short account of a passenger ship now building, to be driven by Parsons' turbines. This was from a paper read by Mr. Parsons at the Glasgow meeting of the Institution of Engineers and Shipbuilders. In the same paper were other interesting facts and opinions. Mr. Parsons said the "Viper" (destroyer) has passed all her official trials, and had fulfilled all the guarantees of her contract. She had exceeded the 31 knots guaranteed by over five knots, and as regarded the guarantee of 2.5 pounds of coal per indicated horse-power at 31 knots, she easily obtained a consumption of 2.38 pounds. The "Cobra" had duplicate machinery to the "Viper," and was now the second fastest vessel afloat. As to the future, though for obvious reasons up till the present time turbines had only been fitted in vessels designed for phenomenal speeds, yet it must not on this account be assumed that they are only applicable to such vessels. The two conditions of suitability are that the vessel shall have a moderately fast speed and be of moderately large size. For slow vessels of moderate and small size the conditions for turbine machinery are not at the present time so ad-

vantageous. The class of vessels most suitable for the application of turbine machinery are: Pleasure steamers, passenger and cross-Channel steamers, liners (including Atlantic liners of the largest size), also all fast war vessels such as torpedo boats, destroyers, cruisers of all sizes, protected cruisers and all battleships of the usual speeds.

New Classification of Locomotives—New York Central & Hudson River Railroad.

We give herewith enough data to make clear the method now adopted by the Motive Power department of the New York Central, in re-classifying locomotives of that railroad. This was referred to in our description of the new Class I engines, Feb. 1.

We give the new classification and the corresponding old classification of all engines of the New York Central proper, the equipment of subsidiary lines not yet having been thus classified; also a key to classification showing

PARTIAL CLASSIFICATION AND DATA.

Class.	Cylinder.			Grate Area, Sq. Ft.	Heating Surface, Sq. Ft.	H. S. G. A.	H. S. C. V.	Weight.		Diam. Driv.	Boiler Pres.	Tractive Force Level Tangent.	
	New.	Old.	Diam.	Stroke.	Volume, 2 Cyls.			On Drivers.	Total.				
B	K	18	24	7.06 Cu. Ft.	22.6	1278.7	56.6	181.12	97,100	97,100	51	145	3,009
B-1	K-1	19	26	4.27 H. P.	31.3	1734.0	55.4	406.09	125,000	125,000	51	180	4,274
B-2	K-2	19	26	8.54	31.54	1760.93	55.8	206.20	133,000	133,000	51	180	4,510
C	I	19	24	7.88	27.3	1821.5	66.7	231.15	80,000	120,000	{ 78	180	{ 2,998
C-1	I-1	19	24	7.88	30.7	1974.0	64.3	250.51	90,100	134,600	{ 84	180	{ 2,677
C-2	I-2	19	24	7.88	30.7	1974.0	64.3	250.51	88,500	131,000	{ 70	180	{ 2,484
C-3	I-3	19	24	7.88	30.7	2404.1	78.3	305.09	90,400	146,400	{ 77	190	{ 2,677
E	J	19	26	8.54	29.77	1763.0	59.2	206.44	104,500	120,000	64	160	3,168
E-1	J-1	19	26	8.54	29.77	1763.0	59.2	206.44	104,500	120,000	57	160	3,571
E-2	J-2	19	26	8.54							64	160	3,168
E-3	P	20	28	10.18	29.1	2583.0	88.8	253.73	131,600	152,000	57	180	4,763
E-4	P-1	20	28	10.18	29.1	2583.0	88.8	253.73	139,200	161,550	57	190	5,006
E-5	P-2	20	28	10.18	30.3	2509.24	82.8	246.49	133,450	155,800	57	190	4,868
E-6	P-3	20	28	10.18	30.3	2509.24	82.8	246.49	134,500	155,200	57	190	4,868
E-7	P-4	23	28	6.44 H. P.	30.3	2500.24	82.8	389.63	134,500	155,200	57	200	4,868
E-8	P-5	20	28	10.18	30.3	2509.24	82.8	246.49	134,500	155,200	63	200	4,801
E-9	V-1	20	28	10.18	34.5	2789.1	80.8	273.9	147,300	167,500	57	190	5,060
E-10	V-2	20	28	10.18	34.5	2732.7	79.21	268.44	145,300	171,000	57	190	5,060
F-2	Q	20	28	10.18	30.3	2908.2	96.0	265.68	128,900	168,900	70	200	4,308
F-3	Q-1	20	28	10.18	30.3	2915.24	96.2	286.36	134,200	175,000	75	200	4,012
G-1	C. C.	23	32	7.69 H. P.	50.31	3250.56	64.61	422.70	162,900	189,000	63	210	5,897
G-2	C. C.	20	26	9.45	40.8	2283.0	55.9	241.57			51	190	
I	C. A.	21	26	10.42	50.3	3505.17	60.7	336.4	94,800	176,000	79	200	3,650
									103,300				3,900

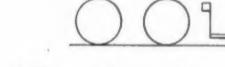
NOTE.—Tractive force based on resistance of 6.5 lbs. per ton.

diagrams of wheel arrangement, with a table of data covering the important features of the engines. Grate area, heating surface, cylinder volume and the several ratios may be found there, with tractive power and various vital dimensions.

Classification on the New York Central, Proper.

New.	Old.	New.	Old.
A	D	C-14	N
A-1	D-1	D	O
B	K	E	J
B-1	K-1	E-1	J-1
B-2	K-2	E-2	J-2
B-3	E	E-3	P
B-4	E-1	E-4	P-1
B-5	E-2	E-5	P-2
B-6	L	E-6	P-3
C	I	E-7	P-4
C-1	I-1	E-8	P-5
C-2	I-2	E-9	V-1
C-3	I-3	E-10	V-2
C-4	A	E-11	M
C-5	A-1	F	C
C-6	A-1-X	F-1	V
C-7	A-2	F-2	Q
C-8	A-3	F-3	Q-1
C-9	B	G	D-2
C-10	B-1	G-1	C. C.
C-11	F	G-2	C. C.
C-12	G	I	C. A.
C-13	H		

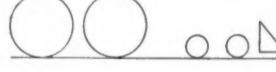
Class A; engines 50 to 190.



Class B; engines 200 to 399.



Class C; engines 400 to 1,399.



Class D; engines 1,400 to 1,449.



Class E; engines 1,450 to 1,999.



Class F; engines 2,000 to 2,199.



Class G; engines 2,200 to 2,599.



Class H; engines 2,600 to 2,649.



Class I; engines 2,700 to 2,999.



Railway Signaling Club.

The regular meeting of this club at Chicago, March 26, was presided over by Mr. S. E. Denny, Vice-President of the Club. Four new members were elected and the by-laws were changed so as to permit the annual meeting this year to be held in October instead of November.

The principal business of the meeting was the discussion of questions presented by members. Mr. Rosenberg (L. V.), President of the Club, who was not present, sent the following questions:

"1. Is the expense of putting spare spaces in a machine warranted unless it is definitely known that they will be needed within a reasonable time?"

"2. (a) Should an automatic signal repairman have a batteryman and lampman? If so, how many miles of track can he look after and keep his work in good shape, assuming that signals are spaced about one mile apart?

"(b) If the signal repairman looks after his own

man to go to each signal at least twice a day. It is believed generally wise to thus concentrate duties.

Mr. Gillingham thinks it desirable on lines remote from cities to furnish three-wheel cars ("speeders") for the men who have to attend to automatic signals.

On Mr. Rhea's question the sentiment expressed was in favor of four-ohm relays in track circuits, rather than nine-ohm.

Mr. Wileman (L. S. & M. S.) said that when the battery is in first class condition and the track circuit the same nine ohms will work all right. On the question whether it is preferable to have automatic block signals of the same form as interlocked signals, the chairman, Mr. Denny (C. & N. W.) held that block signals should be made as distinct as possible from the interlocking signals.

Mr. Cade—Is not the tendency at present to give but one kind of signal to the engineman? Everywhere the number of signals is being reduced as much as possible and automatic block signaling is going to bring up the question whether it is desirable to have the same kind of signal for both kinds of signaling. If you do, you have the embarrassing situation that an engineman, having got in the habit of passing automatic stop signals which stand against him, would sometimes pass a manual signal which was against him. Yet the question of a distinctive signal for the block system seems to be of minor importance when it is considered that no one proposes to try to have block and interlocking signals different from one another at night. I do not offer a solution to this problem, but it will become a very important question in the near future. If the semaphore could be put in at about the same cost as the disk the majority of roads would prefer it; but at night it is no better than a disk, and besides costs more.

In a desultory discussion on the colors to be used in signals at night it appeared that one or more Western roads now use yellow of two different shades. One of these is so light that it may under some circumstances be mistaken for a white light. The question was asked if smoke in front of a glass would not make a yellow light appear red, but Mr. Hiles (C. C. C. & St. L.), who uses yellow, answered no.

Effect of Boiler Scale.

The following letters concerning the effect of scale on the evaporation of boilers seem worth publishing, even though the views expressed are not generally accepted. The position is taken that scale has very little effect on boiler efficiency. What immediately follows is from a letter written by Mr. W. S. Raidler, Master Mechanic of the Green Bay & Western, and was included in the report on water service presented at the last meeting of the Engineering and Maintenance of Way Association. The second letter was written by Mr. W. H. Bryan, of St. Louis, Mo., to the *Boiler Maker* and published in the January number of that magazine. Mr. Raidler says:

"We run flues in our boilers from 14 to 34 months, thickness of scale forming from 1-16 to 5-16 in. We experience no such percentage of increase in fuel consumption when boiler is scaled as is usually given. If you will pardon the statement, I will say that I am surprised how often reference is made to that 'ancient adage' about scale reducing the efficiency and capacity of a boiler. The figures often quoted, which you will find in all recent publications pertaining to boiler scale, namely, a scale of 1-16 in. in thickness requires the extra expenditure of 15 per cent. more fuel. The ratio increases as the scale thickens; thus when it is 1/4 in. thick, 60 per cent. more fuel is needed; 1/2 in. thick, 150 per cent. more, and so on. This is based on the hazy authority of a paper read by Dr. J. C. Rodgers, some years ago, before the American Association for the Advancement of Science. The paper gives little more than the bare statement of results. We have made some very exhaustive experiments with 3 ft. sections of 2 in. locomotive tubing, varying in scale from 1-16 in. to 5/8 in. in thickness. The tests have been made after practical lines, special care being taken as to temperatures of water, etc., temperatures being taken with Centigrade thermometer, Fahrenheit not being suitable for tests made. In a great many tests which we have made in the past six months we have demonstrated without a doubt, and it has been shown repeatedly, that scale has very little effect on the efficiency or capacity of a boiler.

"It is a common experience for locomotives to come into shops with space between the tubes choked solid with scale, but without any deterioration either in capacity or fuel economy having been noticed. The principal and practical objection to scale deposits is the danger of burning. It is shown, on the other hand, that a coating of soot carries with it little or no danger, but causes a great dropping off in both efficiency and capacity. Another thing which would contribute largely toward the deterioration of efficiency and capacity is the neglect, after a locomotive has been in service 14 months or more, and which we consider is more vital than boiler scale, the inattention that a locomotive gets as to cylinder packing, valves blowing, choked nozzles and double-flanged tires, all representing an increased fuel consumption in a greater proportion than scale in the boiler. We are very much interested in the subject of feed water, and certainly not partial to boiler compounds and purges, which have been tried for years and abandoned by our best engineers as ineffectual, injurious and in very many cases positively dangerous.

"Of course it goes without saying that we wash out boilers frequently and see that the work is properly done, and our experience has been that the best substitute for pure water and boiler compounds is to remove the flues, mechanically clean them in shop and replace them at the following cost: To open front end and remove all pipes, including dry-pipe preparatory to doing the work, \$2.30; removing 200 flues, at 3 1/4 cents, \$6.50; replacing same at 5 cents, \$10; regrinding all joints and putting pipes back into en-

gines. This makes it necessary for the signal engineer to take the opportunity to reduce the excessive loads by putting in new levers. Spare spaces cost not over \$8 each, or \$5 where there is a considerable number.

Mr. Gillingham (Hall Signal Company)—Spare spaces are not always usable. The Illinois Central and some other roads now place the machine in the tower close to one end, leaving room for extension at the other end. This is convenient and economical.

Mr. Morrison (C. M. & S. P.)—In some cases where we have added levers it was difficult to redesign the locking as there was not enough space. Enough brackets should always be left in putting up a machine so that the locking can be changed without crowding the parts.

Question No. 2 was discussed in a desultory way, but no facts of a definite nature were stated with sufficient fullness to enlighten readers not acquainted with the places from which the experience was cited. On the St. Louis Division of the Illinois Central the maintainers of automatic signals are required to attend to their own batteries and lamps. This makes it necessary for the

gines, \$4. In the price of removing pipes and replacing them, the removing and replacing of netting is taken into account, all our engines being equipped with extension front ends. Total cost, \$22.80. Nine tons of coal at \$2.75 represents the trifling sum that is required to remove the boiler scale. In the above calculation it is understood that the loss of the engine's service while in shops is not taken into account. In conclusion, will say that scale has very little effect upon the efficiency and capacity of a boiler."

Mr. Bryan says:

"If you will pardon the statement, I will say that I was surprised to find on page 18 a reference to that hoary adage about scale reducing the efficiency and capacity of a boiler. The figures given were frequently quoted at one time, and were accepted as reasonably accurate. I went to considerable trouble once to run down these figures, and found that they were based upon the hazy authority of a paper read by a doctor before some local medical or scientific association somewhere in the north. The paper itself gives little else than the bare statement of results. It has now been shown repeatedly that scale has very little effect upon the capacity or efficiency of a boiler. It is a common experience for locomotives to come into the shops with the spaces between tubes choked solid with scale, but without any deterioration either in capacity or fuel economy having been noticed. The principal, and practically the only objection to scale deposits is that they increase the danger of burning. The statements you quote are usually found nowadays only among the advertisements of builders of purifiers or of manufacturers of compounds. It is shown, on the other hand, that a coating of soot carries with it little or no danger, but causes a great dropping off in both capacity and efficiency. The incidental advantages of smokeless combustion in this direction are rarely recognized."

Some reference to these letters is made on the editorial pages.

Some Schenectady Consolidation Locomotives.

The accompanying illustrations are of some heavy consolidation freight engines with wide fire-boxes and high steam pressures recently built at the Schenectady Locomotive Works. The simple engine, No. 1143, is one of 20 building for the Boston & Maine Railroad. Ten of them were lately delivered and are working on the Fitchburg Division. The design was made at Schenectady under the direction of Mr. Henry Bartlett, Superintendent of Motive Power of the B. & M.

The two-cylinder compound, No. 2,613, is one of 12 engines just completed for the Southern Pacific Company. These engines rank well up in the heavy-weight list and are built on the regular lines of the Schenectady two-cylinder compound.

The amount and relations of heating surface and grate area, and also the cylinder dimensions, of the engines of both orders are thoroughly modern. Further information is given in the following specifications for both classes of engine.

Boston & Maine Consolidation Freight Locomotive.

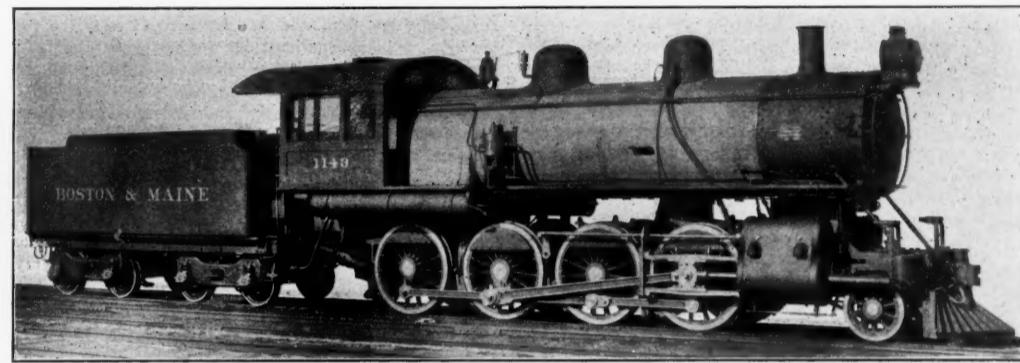
Gage 4 ft. 8½ in.
Fuel Bituminous coal
Weight in working order 162,000 lbs.
Weight on drivers 142,000 lbs.
Wheel base, driving 17 ft.
Wheel base, rigid 17 ft.
Wheel base, total 25 ft. 6 in.

Boiler.	
Style	Straight, with wide fire-box
Outside diameter of first ring	66 5-16 in.
Working pressure	200 lbs.
Material of barrel and outside of fire-box	Carnegie steel
Thickness of plates in barrel and outside of fire-box	21-32 in., 11-16 in., ½ in. and 7-16 in.
Horizontal seams	Butt joint, sextuple riveted, with welt strips inside and outside.
Circumferential seams	Double riveted
Fire-box, length	102½ in.
Fire-box, width	65½ in.
Fire-box, depth	67 in., B 57½ in.
Fire-box, material	Carbon fire-box steel
Fire-box plates, thickness	Sides, ¾ in., back ½ in., crown ½ in., tube sheet ½ in.
Fire-box, water space	Front, 4 in., sides 3½ in. to 5½ in., back 3½ in. to 4½ in.
Fire-box, crown stayings	Radial stays 1 in. and 1½ in. diam.
Tubes, material	Charcoal iron No. 12 B. W. G.
Tubes, number of	326
Tubes, diameter	2 in.
Tubes, length over tube sheets	192 in.
Heating surface, tubes	2,716.87 sq. ft.
Heating surface, fire-box	143.00 sq. ft.
Heating surface, total	2,859.87 sq. ft.
Grate surface	46.51 sq. ft.
Grate, style	Rocking R. R. Co.'s Std.

Diameter and length of driving journals	.9 in. diam. x 12 in.
Main side	7½ in. x 5½ in.; 6½ in. diam. x 6 in.
Diameter and length of side rod crank pin journals	Inter. 5½ in. x 5 in.; F. & B. 5 in. diam. x 10 in.
Engine truck, kind	Two-wheel swing bolster
Engine truck, journals	.6 in. dia. x 10 in.
Diameter of engine truck wheels	33 in.
Kind of engine truck wheels	Standard C. I. spoke cen., with 3½ in. steel tire held by Mansell ret. rings.

Boiler,

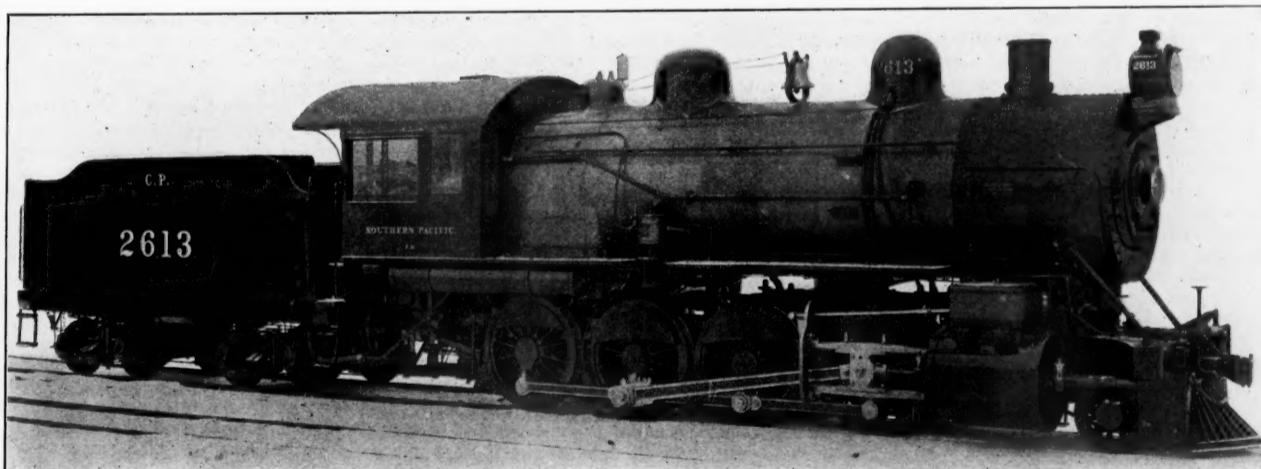
Style	Straight, with wide fire-box
Outside diam. of first ring	76 11-16 in.
Working pressure	220 lbs.
Material of barrel and outside of fire-box	Carbon steel
Thickness of plates in barrel and outside of fire-box	27-32 in., 7 in., 29-32 in., 9-16 in., ¾ in. and ½ in.
Horizontal seams	Butt joint, sextuple riveted, with welt strip inside and outside.
Circumferential seams	Double riveted
Fire-box, length	108 in.
Fire-box, width	72½ in.
Fire-box, depth	13½ in. F. & B. 64½ in. B.
Fire-box, material	Carbon fire-box steel
Fire-box plates, thickness	Sides 5-16 in., back ½ in.; crown ½ in., tube sheet 9-16 in. to 6 in.; back 3½ in. to 4½ in.
Fire-box, water space	Front 4 in. to 4½ in.; sides 3½ in.



Simple Consolidation Locomotive—Boston & Maine.

Ash pan, style	Radial stays 1½ in. diam.
Exhaust pipes	Single
Exhaust nozzles	
Openings equivalent to 3 9-16 in., 3 11-16 in., 3½ in. diam.	
Smoke stack, inside diameter	14 in.
Boiler supplied by	Hancock Composite Inspirator, No. 8 and 9
Weight, empty	44,250 lbs.
Journals, diam. and length	5 in. diam. x 9 in.
Wheel base	17 ft. 1 in.
Tender frame	10 in. steel channels
Tender trucks	Fox pressed steel bolster type
Water capacity	5,000 U. S. gallons
Coal capacity	10 tons
Total wheel base of engine and tender	53 ft. 9 in.
Engine equipped with Westinghouse-American combined brakes on drivers, tender and for train; Westinghouse 9½ in. air pump; Westinghouse friction draft gear on tender; Franklin sectional lagging on boiler and cylinders; two 3 in. Ashton safety valves, muffed; Sterlingworth brake beams on tender, and "She" pneumatic sanding device.	
Tender	
Weight, empty	43,200 lbs.
Journals, diam. and length	5 in. diam. x 9 in.
Wheel base	15 ft. 8 in.
Tender frame	10 in. steel channels
Tender trucks	Two four-wheel trucks, with Shickle, Harrison & Howard cast-steel bolster
Water capacity	4,500 U. S. gallons

Fire-box, crown stayings	Radial stays 1½ in. diam.
Exhaust pipes	Single
Exhaust nozzles	
Openings equivalent to 3 9-16 in., 3 11-16 in., 3½ in. diam.	
Smoke stack, inside diameter	14 in.
Boiler supplied by	Hancock Composite Inspirator, No. 8 and 9
Weight, empty	44,250 lbs.
Journals, diam. and length	5 in. diam. x 9 in.
Wheel base	17 ft. 1 in.
Tender frame	10 in. steel channels
Tender trucks	Fox pressed steel bolster type
Water capacity	5,000 U. S. gallons
Coal capacity	10 tons
Total wheel base of engine and tender	53 ft. 9 in.
Engine equipped with Westinghouse-American combined brakes on drivers, tender and for train; Westinghouse 9½ in. air pump; Westinghouse friction draft gear on tender; Franklin sectional lagging on boiler and cylinders; two 3 in. Ashton safety valves, muffed; Sterlingworth brake beams on tender, and "She" pneumatic sanding device.	
Tender	
Weight, empty	43,200 lbs.
Journals, diam. and length	5 in. diam. x 9 in.
Wheel base	15 ft. 8 in.
Tender frame	10 in. steel channels
Tender trucks	Two four-wheel trucks, with Shickle, Harrison & Howard cast-steel bolster
Water capacity	4,500 U. S. gallons



Compound Consolidation Locomotive—Southern Pacific Company.

Cylinders	
Diameter of cylinders	.20 in.
Stroke of piston	.30 in.
Horizontal thickness of piston	.5½ in.
Diameter of piston rod	.3½ in.
Kind of piston packing	Cast-iron rings
Kind of piston rod packing	U. S. metallic
Valves	
Greatest travel of valves	.5½ in.
Outside lap of valves	.7½ in.
Inside lap of valves	.0 in.
Lead of valves in full gear	1-32 in. blind
Kind of valve stem packing	U. S. metallic
Wheels, Etc.	
Diameter of driving wheel outside of tire	.60 in.
Material of driving wheel centers	Cast steel
Tire held by	Shrinkage
Driving box material	Cast steel
Diameter and length of driving journals	Main 9 in., I. F. & B. 8½ in. diam. x 11 in.
Diameter and length of main crank pin journals	Main 6½ in. x 5 in.; 6 in. diam. x 6 in.
Diameter and length of side rod crank pin journals	Inter. 5½ in. x 5 in.; F. & B. 5 in. diam. x 10 in.
Engine truck, kind	Two-wheel swing bolster
Engine truck, journals	.6 in. dia. x 10 in.
Diameter of engine truck wheels	33 in.
Kind of engine truck wheels	Standard C. I. spoke cen., with 3½ in. steel tire held by Mansell ret. rings.

Cylinders	
Diameter of cylinders	H. P. 23 in., L. P. 35 in.
Stroke of piston	.34 in.
Horizontal thickness of piston	L. P. 4½ in. and 5¾ in.; H. P. 4¾ in. and 5½ in.
Diameter of piston rod	.39 in.
Kind of piston packing	Cast-iron rings
Kind of piston rod packing	Jerome metallic
Size of steam ports	L. P. 23 in. x 2½ in.
Size of exhaust ports	L. P. 23 in. x 3 in.
Size of bridges	L. P. 1½ in.
Valves	
Greatest travel of valves	H. P. piston type; L. P. Allen-American balanced
Outside lap of valves	.6 in.
Inside clearance of valves	.¾ in.
Lead of valves in full gear	1-16 in.
Kind of valve stem packing	Jerome metallic
Wheels, Etc.	

Weight in working order	200,000 lbs.
Weight on drivers	176,000 lbs.
Wheel base, driving	15 ft. 8 in.
Wheel base, rigid	15 ft. 8 in.
Wheel base, total	24 ft. 4 in.
Cylinders	
Diameter of cylinders	H. P. 23 in., L. P. 35 in.
Stroke of piston	.34 in.
Horizontal thickness of piston	L. P. 4½ in. and 5¾ in.; H. P. 4¾ in. and 5½ in.
Diameter of piston rod	.39 in.
Kind of piston packing	Cast-iron rings
Kind of piston rod packing	Jerome metallic
Size of steam ports	L. P. 23 in. x 2½ in.
Size of exhaust ports	L. P. 23 in. x 3 in.
Size of bridges	L. P. 1½ in.
Valves	
Greatest travel of valves	H. P. piston type; L. P. Allen-American balanced
Outside lap of valves	.6 in.
Inside clearance of valves	.¾ in.
Lead of valves in full gear	1-16 in.
Kind of valve stem packing	Jerome metallic
Wheels, Etc.	
Diameter of driving wheels outside of tire	.57 in.
Material of driving wheel centers	Cast steel
Tire held by	Shrinkage
Driving box material	Cast steel

Coal capacity	.0 tons
Total wheel base of engine and tender	.52 ft. 4½ in.
Engine equipped with Westinghouse-American combined brakes on drivers, tender and for train; Westinghouse 9½ in. air pump; Westinghouse friction draft gear on tender; Ross-Mechan driver brake shoes; Franklin sectional lagging on boiler and cylinders; three 3-in. Consolidated incased safety valves, and Leach pneumatic sand feeding apparatus.	
Tender	
Weight, empty	43,200 lbs.
Journals, diam. and length	5 in. diam. x 9 in.
Wheel base	15 ft. 8 in.
Tender frame	10 in. steel channels
Tender trucks	Two four-wheel trucks, with Shickle, Harrison & Howard cast-steel bolster
Water capacity	4,500 U. S. gallons

Railroads and the Fine Arts.

The Art and Literary Society of Officers of the Paris, Lyons & Mediterranean Railroad of France has arranged an exhibition of paintings and water colors made by employees of all grades of that railroad, the Western, the Orleans, the Eastern, the Southern, the State Railroads and the Eastern Algerian. The President of the Society is one of the directors of the Paris, Lyons & Mediterranean, and is said to be himself a distinguished sculptor, poet and musician. Fifty-five pictures are shown in this exhibition. It would be entertaining to see a similar exhibition of the works of art of American railroad officers.

Steel Framing for Freight Cars.

We published last week, page 218, a paper by Mr. G. W. Scott on Steel Framing for Freight Cars, presented at the last meeting of the Western Railway Club. The discussion of that paper follows:

Mr. S. P. Bush, Chicago, Milwaukee & St. Paul—Mr. Scott says in requirement No. 4, "A system of underframing competent to carry the whole of the dead and applied loads without assistance from any associated upper structure, and no less competent to hold up, structurally unimpaired, under the general conditions of car service." We have used cars for many years with undertrussing that has served good purpose and in the introduction of steel construction there is a noticeable tendency to dispense with this principle. It may be that it can be dispensed with, but it is not entirely clear to me why it should be. I do not see why the distribution of the metal, which we get in the truss rod applied to the steel car as well as the wooden car would not give satisfactory service. I believe you can get more carrying capacity with less dead weight.

I do not quite understand why it is necessary to carry all the load on the center plate. We never have, and I do not know of any reason why we should be obliged to. In fact, there are many reasons why we should not carry the load on the center plate. You have to have a heavier truck bolster and you have to have a heavier body bolster, and it means more expense and more dead weight.

I do not see why it is necessary to have a central single member. That increases the distance between the central member and the next member. The floor has got to be supported, and you have to introduce something intermediary to support the floor. It seems to me when you are through adding those things that are necessary to support the floor, you have as much dead weight and possibly more by confining the construction to a single member than by having the two. In connection with that single member it is necessary to apply between the body bolster and the end sill two members which will be used for attaching the draft gear. It is an open question whether it is not better to have the center members run straight through the car for two reasons. First, if it runs through the car, that portion which extends from the body bolster to the end of the car acts as a cantilever to support quite a load; it not only supports that part of the load which projects over the bolster, but it also acts to hold up the load in the middle of the car. In that way it is valuable. Again, with those two members getting the constant pushing and pulling that must come, it is a question whether, with riveting as it is ordinarily done, there is not going to be a great deal of difficulty in keeping those two members tight in place.

In reference to the comparison in the weights of cars Mr. Scott speaks very sensibly. You might have a car of 100,000 lbs. capacity and 3,000 or 4,000 cu. ft. capacity, and you might have another one of 100,000 lbs. capacity and double that cubic capacity. It is unfair to compare weights except on that basis and it is also manifestly unfair to make any comparison in weights without making some reference to the factor of safety. I believe there is another principle that the Master Car Builders' Association could very well adopt: They could adopt for their standard a fiber stress in certain important members of the car of 12,000 or 13,000 or 14,000 lbs., or whatever the figure might be. That would be a wise precaution to take; it would have the effect of regulating, to a certain extent, practice in this regard, and it would have a strong moral influence in regulating construction and the Association would thus lend its influence in the direction of good construction and it would be a decided economy in the long run to the railroads.

Mr. G. R. Henderson, Chicago & Northwestern—There are several paragraphs which I would like to endorse, especially the second one, "The use of materials which may be obtained as nearly as possible in their finished forms, and throughout the country at large, and preferably independently of any one manufacturer." I think this is one of the most important points which should be observed in the building of steel cars. The great objection I have to the pressed steel shapes is that if they are manufactured by an Eastern concern, and the car should happen to be in the West at a time when repairs should be made, there would be delay in getting material to the point where the repairs are to be made; whereas, if they are made up of structural shapes they can be obtained from almost any manufacturer. There should be less time lost and less expense in making repairs to foreign cars.

In regard to Section 4, "A system of underframing competent to carry the whole of the dead and applied loads without assistance from any associated upper structure, and no less competent to hold up, structurally unimpaired, under the general conditions of car service." I have always felt in the same line as Mr. Scott in regard to steel frame cars. I cannot give any particular reason for it, but I think it is quite an advantage to have the car framing strong enough. No matter how good railroad men we may be, or how good structures we have to deal with, a collision will occur sometimes, and the result will be that material underneath will be stripped off. We had on the Norfolk & Western quite a number of tender frames which were practically flush underneath and the same as on top, and in case of a collision the damage to the frame was very small. In fact, \$20 or \$30 worth of work would put it in as good shape as ever, whereas, if there is a lot of rigging underneath, it is easy to see that is more readily destroyed.

There is one thing in steel car construction which has been omitted and which I think is a valuable point, and that is to provide a wooden end sill. I would have a construction practically the same as Mr. Scott shows, a complete metal structure, but at the end have a wooden sill of 8 or 10 in. The particular thing is, when the cars do get together and the dead locks, if they are used, come into play you have a soft structure to interrupt the blow, and I think it will save trouble and lengthen life by absorbing the blow. This wooden sill gives good results and it can be replaced whenever a new one is required and they will prevent many dents and other troubles.

Mr. Scott—Mr. Bush calls attention to the paragraph about truss rods. I advocate this more rigid construction because of the practically indeterminable character of the shocks and stresses to which a car in service is subjected. If in designing a car framing we consider only the vertically applied loads, then the regular bridge construction, with its tension and compression members, would be in order; but, unlike a bridge, a car must be stiff enough to withstand end shocks applied through the drawbars, and I submit that for such stresses the design in Fig. 1 is not without its distinct advantages. For not only does it constitute a rigid medium through which drawbar pulls and pushes may be transmitted, but concentrating the mass of the material of the framing in the direct line of the drawbar shocks serves to modify the influence of such shocks and in a manner scarcely possible with any system of trussed framing. The absence of truss rods, needle beams, etc., under a car is also desirable, in that it affords ready access for those engaged in the work of inspection and repairs. It is, of course, a very simple matter to calculate the carrying capacity of an undertruss, but not quite so simple to calculate the stresses entering into a combination of members consisting of a floor framing, an underframing, and a more or less complex upperframing. For such a structure it is practically impossible to determine the respective loads upon the several members.

Regarding proposition 6, which reads, "A system of underframing consisting of members having equal upper and lower flanges, between which the horizontal forces from and through the drawbars may be transmitted," I may say that this form of construction seems desirable in view of the heavy drawbar shocks incidental to train movement. The ideal position for the draft gear would be in the neutral axis of the draft and center sills. In the design before us the center line of the draft gear is somewhat below the neutral axis.

With regard to proposition 7, which reads, "A system of underframing having a central rigid connection for the purpose of transmitting direct from drawbar to drawbar the shocks due to impact, in addition to the ordinary stresses consequent on the movement of the car or train," I can only say that the ability of any system of underframing to withstand the shocks referred to depends upon having enough material in the path of the shocks and of sufficient rigidity in the resisting medium to withstand failure from buckling or crippling. As an economical procedure I think it will be granted that if one member is found sufficient for the purpose, there is no good reason, save custom, why two or more should be used. And attention has already been directed to the advantage of the single center sill with respect to delivering its load direct to the center plate.

Mr. Bush prefers to use two center sills extending from end to end of the car. On this point I would say that running center sills from one end of the framing to the other necessitates the attachment of side and intermediary pieces to form the body bolster, or else of a separate bolster placed beneath the sills. Inasmuch as the body bolster is a decidedly important member in a car framing, it should, to my mind, be structurally complete in itself; and if we can employ it as a distinct member in the car framing itself, as shown in Fig. 1, the advantage is still more pronounced.

Mr. Bush directs attention to what, if I understood him correctly, he considers a weakness in the application of the draft beams and end sills. On this point it may be remarked that while the end sill is cut out, as shown, for the drawbar, the strength of the end sill is still abundantly sufficient for the purpose of withstanding shocks and loads. And it may be observed that the end sill forms one side of a rectangle of which the body bolster and the cantilever portion of the side sills constitute the other three sides; and investigation will show that while this construction may be unusual, it is more than sufficiently strong for the requirements in the case.

J. H. Mitchell, Pressed Steel Car Co.—In looking over this paper I find that Mr. Scott did not give any figures in regard to the sections he used, so that no mathematical deductions can be made, but the general principle which he has used seems to be at fault in many points, viz.: He has lost sight of one of the primary points in construction for railroad equipment, i. e., minimum weight with maximum strength. We feel certain that the design of underframing shown will weigh at least 2,000 lbs. more than the pressed steel construction for a 100,000-lb. capacity flat car.

The use of one center sill, it seems to me, will not meet the requirements, especially in 100,000-lb. capacity cars. The tendency of this section, especially in a long car, will be to buckle, due to the end thrusts on the couplers, and the section of this I-beam would have to be made so deep that it would necessitate a very heavy beam, besides making the body bolster deep on account of its connection with the center sill. In the old style of sills

the thrust is transmitted through two sills, and is, therefore, better taken up by a larger area, thus causing less damage to each respective part, such as the bracing, and everything that comes in contact with the center sills.

The great number of rivets in the body bolster, which are concentrated at the center, would tend to weaken it very considerably. For that reason I do not think that a single I-beam construction for the body bolster would be sufficient. The strongest part of the bolster should be at the central point. I note that he has strengthened this somewhat by means of braces, but the strength should be in the bolster itself. A weak point in the end construction is the bracing, and there is no brace for the coupler horn on this framing. The construction as shown would not stand. I think Mr. Scott has the right idea in regard to the underframing carrying the entire weight in his box car design, but unfortunately he does not give the sections which he used in his upperframing, so we cannot say whether he is using an excessively strong framing or not.

In regard to pressed-steel underframing, there are several points which I wish to call your attention to. First, that throughout the entire design the question of maximum strength with minimum weight has been considered, as, for instance, in the side and center sills. One of the advantages of this design of sill is the elimination of about 1,000 lbs. of material from the weight of the car as compared to that built of rolled steel channels of equal strength. In the pressed steel underframing two center sills are used which are braced with pressed steel diaphragms pressed with flanges, so that it is not necessary to rivet on an angle connection for fastening to the sills. This avoids the extra handling and cost of manufacture, and eliminates a number of additional parts, and at the same time strength is maintained. In the center and bolster construction of the pressed-steel underframing the parts are joined in such a manner as to reinforce one with the other and materially add to the strength and the value of the body bolster. The body bolster is constructed of such shape and design as to afford the best of support to all the parts it comes in contact with, thus distributing the thrusts and concussions, and thereby materially increasing the durability of all the parts.

In answer to Mr. Scott's remarks regarding the injury of the metal due to the distorting and straining action in the process of manufacturing pressed steel, I would say that the designer of the pressed steel parts has so designed each part that in the course of manufacture the parts will not be strained or distorted, but are so shaped as to afford greater strength than can be procured from a rolled shape of the same weight. A great deal of our large pressing is done cold, while the smaller and irregular shapes are pressed hot, and up to the present we have not had any failures from this. I wish to call the attention of the gentlemen present to one point particularly in favor of pressed-steel construction, and that is we are able to increase the section at any particular point, thus obtaining the maximum strength with minimum weight.

F. H. Stark, Cleveland, Lorain & Wheeling—The underframing should be designed as far as possible regardless of the capacity of the car, with a view of maintaining the same lengths and sections as far as possible. It is almost necessary to have the same capacity of simple members, the same strength in the end sills, and the same floor supports, whether it be a 30-ton car or a 50-ton car. These lighter-capacity cars must run in the trains with the heavier-capacity cars, and the shocks incident to railroad service are practically the same in one capacity car as they are in another. The floor supports must of necessity be practically the same.

In view of the difficulty to establish and maintain standard pressed shapes, it would seem wise to introduce rolled shapes and thus facilitate the renewing of parts and insure cheaper material. I believe we ought to design a car with a view of facilitating the repairs. The location of the rivet holes should be such as to enable us to remove these parts and apply the rivets.

It is very desirable to carry the whole load on or through the longitudinal members, but I notice in the steel gondola cars that are built on this principle that the dead weight is equal to that of a well-designed box car, and, as Mr. Bush has said, I see no reason why we cannot use the upper structure in the gondola cars and thus reduce the weight on the frame. Surely in a box car we must have side walls sufficient to hold the wall vertically against bulging, and we might just as well use the sides to help carry the load.

In regard to the point raised by Mr. Henderson, I do not believe that we could afford to carry additional dead weight all the year around to provide against an occasional accident. It is true that when we knock a truck back under the car we knock out the trussed posts and bend up the truss rods, but we ought to spend more money to perfect our car frames and less money in car construction to make provisions for these accidents.

In regard to No. 7 I am inclined to favor Mr. Bush's idea that these connections should be continuous. It might be desirable to have them cut off at the body bolster as a matter of convenience in repairs. When the car is loaded a shock tends to force the end down and with the pulling strain it is the reverse, and the innumerable reactions will shear off the rivets as sure as fate. I agree with Mr. Henderson that it will be a good idea to have an oak sill in addition to the metal end sill. I saw some cars designed by the Norfolk & Western recently and the wooden end sill is fitted in between the flanges

of the metal sill. This stiffens it horizontally, and if the car is cornered it does not so readily destroy the end sill as it does in our present practice.

The question of a draft attachment is the most difficult problem to solve. This does not come directly under this subject, but with the steel construction the shocks are so rigid and the longitudinal members being of steel, there does not seem to be any spring as is the case with the wooden car. I believe we must design something that will give us more spring capacity and more yielding travel. A travel of $1\frac{1}{4}$ to 2 in. is not enough to consume the enormous shocks of these large cars coming together.

In the point raised by Mr. Bush regarding the load being carried partly at the sides I presume he has in mind the use of a practical roller side bearing. We all appreciate that if we had this we could reduce the weight of the truck bolster and body bolster some 600 lbs. per car. With a practical side bearing that is durable we would accomplish the same result in allowing the truck to rotate freely and relieve the flange wear and decidedly reduce the weight of the car.

I am inclined to believe that more than three sills are necessary. It was my privilege to see a car constructed after this plan and the floor supports are insufficient. If we were to drop a lot of steel billets, or heavy ore, it would knock a hole through the floor any time. The floor joists or nailing strips should be secured parallel with the longitudinal sill members, so that when the floor is nailed transversely across the car and secured to these floor joists, the car will be more rigid diagonally than when the floor is set up on the floor joists.

Mr. Scott—With regard to Mr. Stark's comments concerning the strength of the floor in a car which he examined at the Pullman Works the flooring in that particular case was supported on six 3×6 in. wood nailing joists in addition to the support given by the flanges of the center and side sills. I may also add that many of those who have examined the car referred to were of the opinion that less than six joists would be sufficient, and with this opinion I am inclined to agree. Mr. Mitchell, however, goes beyond a matter of figures, and he well nigh concludes that the system of underframing under discussion cannot well be built, and that if it were it would surely fail. In the face of what Mr. Mitchell has read to you it would seem highly proper that I should make some direct reference to what has been done in the way of a practical illustration in connection with the system of underframing now before us, and in so doing I wish it understood that I am in no wise representing or speaking for the Pullman Company, but merely referring to certain definite facts. In this connection, then, I may say that two cars were built by the Pullman Company in accordance with the general lines referred to in the paper, the one a box car and the other a gondola or coal car. The two cars were built for a carrying capacity of 80,000 lbs. On the completion of the gondola it was loaded with 120,000 lbs. of bar iron, and with this 50 per cent. overload it was bumped over frogs and crossings in a portion of the Pullman Works. Despite this excessive overloading the body side bearings were well apart from the truck side bearings, and the deflection of the side sills did not exceed $\frac{1}{8}$ in., the deflection disappearing with the unloading of the car.

Later the gondola was turned over to the Chicago & Alton and put in regular service. Subsequently the car was subjected to test, and from a report which was read to me it appears that the test consisted of running this car at 25 miles an hour, on two different occasions, into a train of old and standing cars; and that for a third test the car was run cornerwise into a box car. I am not informed as to the result of the test so far as the cars are concerned which were run into, but the only damage done to the gondola was the failure by fracture of some grey iron castings used in the trucks, and also of one cast-iron center plate. The framing, however, remained intact save for the failure of one of the corner braces K. Presumably the fracture of the corner brace K occurred during the third test, and as a result of the heavy bending moment set up in that member by the corner shock.

J. J. Henessey, Chicago, Milwaukee & St. Paul—There are many commendable features about the design. I fully agree with Mr. Scott that the coming car should be of commercial shapes; shapes that can be procured by the railroad companies all over the country.

There are some features in the car, however, that I do not agree with. I do not agree with the idea of having one sill in the center. There should be two center members extending the whole length of the car, and forming what are commonly called now the draft timbers. With the single center member, you have to use short draft timbers, and in buffing, you strike below the center line, and there will be a tendency to bend the end down and the center up; or in pulling it is just the reverse. Then again as the car is designed the weak part of a car seems to be that of the side sills. My past experience with box cars has been that they fail oftener right over the body bolsters, or right over the side door posts. It is true there are some reasons why wooden cars should fail in this way and iron cars not be as liable to. Nevertheless, the fact remains that this is the weak point. The application of the body bolster cuts away the side sills at a very vital point, greatly weakening the side sills and having a tendency to weaken the body bolster, as I will term it, where attached to the center sills. Referring to Fig. 2, I do not clearly understand the object of the long brace. Unless the car is made remarkably heavy it will be liable to spring up under severe shocks, and if you make it so heavy that it will not do this, it certainly seems to me it would be making it too heavy for practical service; there

would be too much dead weight carried. Now if it springs up in the center I do not see how it can prevent the buckling of this long brace. Then again where side plates fail in wooden cars I think they will also fail in a metal car, that is, right over the door posts, and you will notice the plan shows the plates badly cut away at this point. If the plate breaks at all, it will be at this weak point and I think there are liable to be failures at this particular location. The other points that I had thought of have been pretty well covered by Mr. Stark.

I will say just one word more and that is regarding the carrying of load on the center plates. Now, we have all advocated for years the carrying of loads on the center plates, but I can say that any man who will go through our railroad yards to-day will find the percentage of the loads carried on the center plates is so small that it is hardly worth considering. You can go through the yards and in the first 100 cars you will come to, take them promiscuously, 95 per cent. are down solid on the side bearings. To remedy this it is necessary either to put an enormous amount of metal in the bolsters or to carry part of the load on the side bearings.

S. P. Bush—One of the gentlemen has laid stress on the fact that what is most desirable is the greatest strength for the least weight. Without regard to any particular form of car construction, whether it is pressed steel or commercial shape, I do not think that any of them have demonstrated up to the present time that they can build a lighter car, of 60,000 or 80,000 lbs. capacity, without undertrussing than can be built with it, or even as light. All of the steel car builders are laying a good deal of stress on the point of getting rid of the truss rods but they have not yet demonstrated that they can build as light a car without them of the 60,000 or 80,000 lbs. standard.

The Locomotive of the Future.

At the February meeting of the New England Railroad Club Mr. S. M. Vauclain delivered an illustrated lecture on "Locomotives of the 19th and 20th Centuries." It was a running review of the development of the locomotive up to the present time illustrated by many lantern slides. Our readers will be interested in the few words which follow, giving something of Mr. Vauclain's notions of what is likely to happen pretty early in the twentieth century, and in the discussion on piston valves and Atlantic type engines.

The improvement of the locomotive will embrace the further development of those features invented in the previous century, compounding of all locomotives upon some system now used, or yet to be invented, will be almost universal, the wide fire-box and tubular boiler will be carried to the limit of human ability to manage it. This will give place to the water tube boiler, especially so for high speeds. Who that is here to-night is destined to be the instrument of its introduction? Already bright minds are employed in designing a boiler of this description which can be placed on our arrangement of cylinders, underframing, wheels and machinery—a system that will give three times the heating surface for an equivalent weight. Higher pressures will then be common, and we all may live to see triple and even quadruple expansion locomotives almost noiselessly performing their work. High speeds will be used for all trains carrying human freight, but long and heavy express trains will be handled with facility by the improved high-pressure compound locomotives of that period. The loading gage of our trunk lines will not prevent doubling, or even trebling, the power of locomotives for freight traffic. Double bogie engines similar to those used abroad, but on the American idea, will be employed, thus reducing it to an almost perpetual operating machine, any part of which can be removed in a short time and a duplicate substituted.

Electricity as a motive power will steadily gain friends, large plants will be erected for supplying current, water power where available is now being employed; the lives of great men are being spent in an endeavor to solve this great problem. One of the greatest, if not the greatest of all relies upon the use of gas, made at the mines and sent through pipes to the power plants placed at intervals along the line, and used direct in gas engines of huge units for generating the current necessary to operate the traffic of the road. . . . Perhaps so, but it is the opinion that for our trunk line traffic electricity will not be used until it can be generated economically on the locomotive itself. It is in this direction we look for success, as we now use up but a small per cent. of the calorific power of coal in our best steam locomotives. . . . As the electric locomotive occupies relatively the position that steam locomotives did a century ago, those who live in 2001 may merely have recollections of the wonderful events of our present age.

Have any of you as yet considered to what extent the pneumatic tube will be employed to expedite transportation now entirely dependent on locomotives? Has anybody watched the long lines of coal cars on their way from the mines to the coast, and the same cars return empty? If the weight of a car is 25 per cent. of the gross load, we have more than 50 per cent. loss, or non-paying freight, when we consider that the empty train requires quite as much power to haul it up into the interior as was expended taking it to the coast. Is it not possible? Will it not be accomplished? And just as the miles of cars loaded with oil, seen in former years, have disappeared, and that commodity sent hundreds of miles through a tube in the ground, will coal, grain and ore be

sent speeding through tubes to central depots for local distribution. . . .

Discussion.

Mr. Vauclain.—We have built in all about 450 locomotives for burning petroleum, and we have been entirely successful with every one of them. The device that we use is a device that has been in use for many years in Peru on the Oroyo road. It consists of one pan, immediately over another pan. The upper pan is the pan over which the oil flows. The under pan has a throttle at its mouth, and is the steam pan. The heat from the steam liquefies the oil, and as the oil drops over the edge of the pan or burner, it is caught by the steam jet, which is probably 3 or 4 in. in length, and about the thickness of a piece of paper, and it is spread out over the interior of the fire-box. No further preparation is necessary on a locomotive other than to remove a portion of the grate bars. There is a little fire brick near the front end to protect the throat sheet. The burner is fastened to the bottom of the mud ring and at such an angle as will allow it to shoot up into the fire-box. Most of our locomotives that we have built for the Russian Government in the last three or four years have been able to burn refuse petroleum, and are all giving most excellent satisfaction.

Mr. F. W. Dean.—I think that the most important feature of the tendency of present practice is the recognition of the Atlantic type of locomotive. The fact that other builders than the Baldwin Locomotive Works have begun to build them shows such recognition. It is my belief that this will be the most conspicuous type of passenger locomotive to be seen on roads where loads of any great weight are to be hauled at high speed. Mr. Vauclain passed over that matter somewhat hastily, and perhaps did not explain its advantages, but, as I understand it, the advantages of the Atlantic type of locomotive are that the driving wheels are entirely in front of the fire-box, and that the fire-box can thereby be made wide. More grate area can be obtained than in the ordinary locomotive without excessive length of fire-box. Great length of fire-box means difficulty in firing. The Atlantic type not only gives great width of fire-box, but also considerable depth, because there is underneath small pair of trailing wheels. The trailing wheels serve also to carry the extra weight of the large fire-box and boiler. In this way boiler capacity is very much increased. The tendency in the large locomotives in the last few years has been to increase the heating surface, while the grate area remained constant, but by the use of the Atlantic type, the grate of the locomotive is very much extended, and keeps pace with the heating surface. . . . There is another thing that Mr. Vauclain has not touched upon, viz., piston valves. I think that most of us have the idea that piston valves are not successful pieces of apparatus, and I should be glad to have his opinion of them. I have had some doubt about them, and should be glad to have it removed. I should be glad also to know from Mr. Vauclain whether measurements show that by the use of piston valves the areas of indicator diagrams have been increased in comparison with those from slide valve engines, the locomotives being of the same general character and size.

Mr. Vauclain.—In our four-cylinder compound we find it necessary to use a piston valve. The piston valve was objected to by many. It was one of the principal things on the engine that it was thought would condemn it, and would prove a source of weakness in its design. The object of using the piston valve was to combine two valves in one, and at the same time provide a receiver for the high-pressure cylinder to temporarily exhaust into before the low-pressure engine was ready to receive its charge of steam. The use of piston valves on the simple engine is quite a different matter, however, and I have so far in my experience failed to see the necessity of using piston valves on a simple or single-expansion locomotive. The piston valve on a single-expansion locomotive, while it may have some advantages, has disadvantages. The balance of favor, however, from my observation and from my point of view still rests with the slide valve, if properly designed. The piston valve is said to operate more steadily and easily, but I fail to see it, provided the slide valve is properly adjusted. There is a serious source of inconvenience in the use of the piston valve, as it seals the cylinder at a time when the engine may be working water, thus causing damage to the cylinder heads, the water not being able to escape. We have met with this difficulty in compound locomotives where we have been compelled to use the piston valve, and we have provided means for overcoming it, that is to relieve the cylinder of excessive pressure that would be caused by the entrapped water. With the single-expansion locomotive in introducing piston valves we have introduced something that will require the introduction of something else to avoid an accident.

Referring to Mr. Dean's mention of the Atlantic type of engine, I would say that in freight service the measure of the efficiency of the locomotive is its maximum tractive effort, the ability of the cylinders to utilize all the weight on the driving wheels. That is not so much a question of boiler capacity, but in passenger service I may state that it is entirely the opposite. It is there a question of steaming capacity, not maximum tractive effort. It is therefore considered better and wiser engineering for that class of traffic to build a locomotive of the Atlantic type rather than of the ten-wheel type which has been used by many roads, as in the Atlantic type we are able to get all the weight on the drivers that is required. Naturally the heaviest passenger trains can be hauled at high speeds except where the grades are exceedingly heavy, and at the same time the loco-

motive is able to use the very largest boiler possible, and by placing the fire-box back of the main driving wheel over the trailer, we are at liberty to make the grate anything that we see fit up to 100 sq. ft., obtaining the ratio of grate to heating surface that is most desirable. Thus it is apparent that this grate would allow a locomotive boiler to be constructed with 6,000 ft. of heating surface for it.

Mr. J. H. Graham.—That the Atlantic type was the result of careful plans no one will doubt, but that it was not an evolution from some other man's effort I cannot allow, for I know that in June, 1880, Wootten placed a pair of 42-in. wheels under the wide fire-box of a single driver engine built for the Philadelphia & Reading. In July, 1884, Alexander Mitchell built an engine with four pairs of drivers and a leading pair of small wheels and a pair under the very back edge of the fire-box; again in February, 1886, Strong shows an engine of the present ten-wheel type with a single pair of small wheels under the fire-box.

Mr. Vauclain.—Mr. Chairman, I would like to reply to that. The speaker has said that in his opinion the Atlantic type of locomotive was an accident. I beg to differ. The time came round when we were given the problem of hauling a certain number of cars at a rapid speed in miles per hour, with a weight on the driving wheels of 72,000 lbs. The tractive effort required, of course, was low, but the steaming capacity required was high. We had never built a Columbia type or American type of locomotive up to that time that we could guarantee to perform this work. The problem was given the utmost consideration, and it was decided to modify the Columbia type of locomotive, adding a four-wheel truck, lengthening the boiler to get the necessary heating surface required, which was 2,400 sq. ft., and at the same time not exceed the limit of weight on the driving wheel over 72,000 lbs. It was not an accident. It was done with intent. The engines were successful, the guarantee was met, and we were paid.

Mr. Graham.—I recall the Miller engine that ran for years on the New York, Providence & Boston, and was built in the latter 80's. L. M. Butler was Superintendent of Rolling Stock. This was a standard engine with a very short wheel base and heavy boiler. When they placed it in service they found the weight on the drivers was too great for the bridges, so they pulled her in and placed a pair of small wheels under the fire-box making the present Atlantic wheel arrangement, although the leading wheels were the drivers. . . . Whoever claims the credit for the Atlantic type must admit he held some excellent material to draw upon, and had the Wootten, Mitchell and Strong designs as well as Gooch's and other British designs as far back as 1845 and 1850.

Mr. Vauclain.—Mr. Chairman, that does not answer the point; the cases are not parallel. The locomotive referred to by the speaker was an accident, but it was not an Atlantic type of engine.

Mr. W. F. Ellis.—Mr. Chairman, I would like to ask a question, how the Atlantic type of engines compare with other types now in use for fast running around curves?

Mr. Vauclain.—Any one running these locomotives over crooked roads will bear witness that they are even more comfortable than a ten-wheel engine. The reason for that is that the trailing wheel carries no connecting rod. There is no driving box or anything of that sort underneath the engineer. He is away back from the main wheel; he is back from the rods; he simply gets the motion of the springs. I have ridden on these locomotives at a speed of over 90 miles an hour, have kept it up mile after mile. I have ridden around curves at high speed, and experienced no discomfort. The advantage as we figure it is that the center of gravity is set high, and we have experienced no difficulty whatever.

The Chairman.—I would like to say a few words in regard to the Atlantic type of engine. Some four or five years ago I rode several times from Camden to Atlantic City on one of the Atlantic type engines. For a number of miles we made a mile in 42 seconds, and the engine took the curves with just as much ease as it did the straight line.

I would like to ask Mr. Vauclain if he would tell us what his experience has been as to the expense of repairs on four-cylinder compounds as compared with a single engine.

Mr. Vauclain.—When you consider the fact that last year we built nearly 500 four-cylinder compound locomotives, and sent them all over the world, principally to American railroads however, and that the originator is still alive, there certainly could not have been very much more repairs than ordinary to those locomotives. On the Chicago, Milwaukee & St. Paul, a road that has used our compound locomotive for several years, all the locomotives are built on this principle. There they find an actual economy in repairs on four-cylinder compound locomotives over their single expansion locomotives. This was not arrived at by comparing two locomotives, but has been arrived at by the repair accounts from year to year. From my point of view I would expect a compound locomotive to cost a little more for repairs than a single expansion locomotive. I base this upon the presumption that compound locomotives carry higher pressure of steam than the ordinary simple engines do; and they have two more cylinders than the ordinary single expansion engine has, which means more joints, more packing and more piston rods. That, of course, gives no credit for the reduced repairs with the boiler or the fire-box, with the less demand made upon it, nor does

it give any credit whatever for the reduced wearing of the valve motion and other parts which are directly benefited by the mechanism employed to operate the valves. I think that the members can safely feel that the repairs to a compound locomotive are not sufficiently greater than those of a single expansion engine to warrant the railroads with which they are connected to continue using single expansion locomotives. The economies obtained in other directions are so large that from my point of view no railroad can economize to a greater extent in its motive power department than by substituting some class of the compound type locomotive for its motive power.

Mr. Dean.—The Vanderbilt fire-box is said to save quite a large percentage of fuel in comparison with a locomotive that has the ordinary fire-box. That is something that I cannot quite understand.

Mr. Vauclain.—Recently Mr. Vanderbilt desired to read a paper before the American Society of Mechanical Engineers, and had no recent data for his paper. I told him that I had intended to make some tests of the Vanderbilt engine on the New York Central, if I was permitted to do so, and he said that he would be very glad to arrange for it; therefore I wrote Mr. Waitt, and he very kindly gave to my representative permission to make such tests as he desired. The test made on the Vanderbilt engine, in comparison with a sister engine,

tion of air through the grates, getting the proper amount admitted, and admitted at the right time and in the right place, the combustion is far superior to what it is where we have a fire-box that is choked with fuel too deep and too thick and improperly distributed.

New Dining Cars of the Chicago, Burlington & Quincy.

On Tuesday afternoon, March 27, the Chicago, Burlington & Quincy exhibited at the Union Station, Chicago, five new dining cars which have just been completed at the Pullman Works. These are all alike and are 70 ft. long and 10 ft. 4 in. wide over side sills, and have six-wheel trucks with 40 1/4-in. wheels. The seating capacity is 30. The inside finish is quarter-sawed Flemish oak and all the wood work is very plain and handsome. The wood work is black, the ceiling is yellow and the carpets and other furnishings are a deep red. At either end of the car is a hammered iron grill. An attractive feature is the Gothic windows, the upper sash of which and the deck lights above are of art glass. The window curtains roll down from the top of the first sash so that the upper decorative sash always shows. The car is so arranged at the ends that the view from the other cars of the train into the dining car is cut off.



Interior of a New Dining Car—Chicago, Burlington & Quincy Railroad.

exactly similar in every respect, with the exception of the size and shape of the fire-box, showed a marked economy in fuel, reaching practically 10 per cent. This caused surprise; it was a new turn of affairs. It was, as Mr. Dean said, unlooked for and unexpected. Internal examination of one of these boilers developed the fact that no scale of any account had accumulated on the crown sheet or on the side sheets, whereas on the crown sheets of the other locomotives a thick scale had formed; sediment had settled and had not been washed off. The fire-box of the ordinary engine was but 42 in. wide, and was full length, I think 10 ft., in round figures, whereas, in the fire-box of the Vanderbilt boiler the grate was about 54 in. wide, having a wider grate, and we therefore did not need so long a grate. The fire doors were rather high, so that a man had no difficulty in looking at his fire and seeing that the fuel was properly distributed. A portion of the economy, therefore, is attributed to the absence of scale in the fire-box and the fact that the grate surface was nearer square and enabled the man to distribute his fuel to better advantage, and also prevented the fireman from carrying too heavy a fire; whereas, in the other engines he can carry the fire as he pleases, and we all know that where it is possible to carry a light fire and have a free circula-

The Gold system of steam heat is used and the ice boxes are fitted with the Bohn system of refrigeration. Probably one of the most notable features is the use of acetylene gas, there being 34 lights in each car. The Adams & Westlake system of lighting is used. The interior of one of these cars is shown by the accompanying engraving made from a photograph taken before the cars had left the builders. As exhibited the cars were fully finished and ready to go into service.

A New Combined Buzz Planer and Side Jointer.

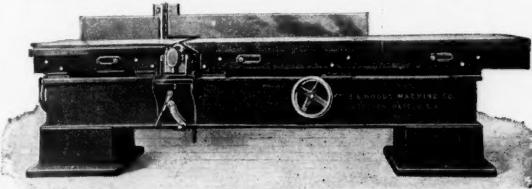
To meet the demand for a hand planer and jointer that will true up and square on two sides simultaneously, the machine illustrated has been put on the market by the S. A. Woods Machine Co., South Boston, Mass. It is built as shown in the engraving, or without the side spindle and jointer head, as desired.

The advantages of this machine over the common buzz planers are numerous. The tables are adjusted on inclined plane, the one before cut being 7 ft. in length, with 6 wedges; the one after cut 3 ft. in length, with 4 wedges. Both these tables are operated by convenient hand wheels. The edges nearest the cylinder are faced with

steel and this lip is detachable, so that should it become chipped a new face may be put on in its place. Ordinarily the edges of the table are of cast iron and this improvement will be appreciated. A system of binder levers is used so that when it is necessary to get at the cutter head the tables may be released from their position and drawn away from the cylinder on parallel planes without using the hand wheels.

The cutter heads are of crucible steel with provision for adjusting for wear. Both heads are fitted with the Woods patent pneumatic pulley which prevents air cushioning of the belt and insures saving of about 30 per cent. in belt power.

The gage or fence, as supplied for ordinary work, will bevel to an angle of 45 deg. An extra heavy special



fence, as shown in cut, is also supplied for use with side head.

The countershaft is equipped with the Woods patent self-oiling loose pulley and may be placed on the floor or overhead, as conditions permit. When belted from overhead, an intermediate shaft with idlers is required for regulating the travel of the side head belting. The machine weighs 4,600 lbs., is 10 ft. long x 30 in. high and carries cylinder 20 in. long and a 9-in. side head, which may be dropped slightly below the level of the back table, or raised to full 9 in. above. This planer is especially valuable for car work.

Meeting of the Engineering and Maintenance of Way Association.

(CONTINUED FROM PAGE 226.)

Bridges and Trestles.—The Chairman of this Committee was Mr. Onward Bates, who, however, was compelled by ill health to resign from that position last November and was succeeded by Mr. W. A. McGonagle, of the Duluth & Iron Range, who signs the report as Chairman, although Mr. Bates remains on the Committee. The work of the Committee was divided among a number of sub-committees as follows:

Mr. I. O. Walker and Mr. D. W. Lum: Timber bridges and trestles, including design, materials, cost, durability, and the conditions which warrant the use of timber in preference to metal construction.

Mr. B. Douglas and Mr. R. Modjeski: Metal bridges and trestles, including design, types, limiting spans and erection.

Mr. Aug. Ziesling: Metal bridges and trestles, maintenance and limit of service of old or light structures, with plans for strengthening the same.

Mr. Edward Barrington: The Mexican practice in railway and trestles, specifications, quality of materials, method of manufacture, mill and shop inspection.

Mr. W. A. McGonagle and Mr. J. P. Snow: Docks and wharves, design, maintenance and operation.

Mr. Edward Barrington: The Mexican practice in railway bridges.

The reports of these sub-committees are not of a nature that can be profitably dealt with by abstract inasmuch as the value of the information depends upon somewhat complete and specific details, and in a number of cases upon drawings. We shall not attempt, therefore, to give more than the briefest extracts from the report, giving the discussion at considerably greater length. The replies received from the circulars sent out by the sub-committees are too few to justify generalization as to practice.

Iron covering for stringers or for stringers and caps is used on six railroads of those answering having a total mileage of 91,791. Of these the Cincinnati, New Orleans & Texas Pacific has used iron coverings the longest. They use No. 15 galvanized. What was put on 24 years ago is still good except a small percentage that has failed by crawling or breaking at bend over corners of stringers. The Nashville, Chattanooga & St. Louis has used No. 22 galvanized iron for 14 years. It is still good. The Toledo, Peoria & Western, using No. 22 galvanized iron, has had it cut out in six years by acid from green white oak ties.

The average of reports would indicate inspections made about as follows: Monthly by bridge men; once or twice a year by Bridge Engineer, Engineer of Maintenance of Way, or Chief Engineer; three roads report this work done by regular bridge inspector. One road requires the Bridge Supervisor or Bridge Engineer to ride the engine of a fast passenger train over the bridges once each way each month. The results are excellent. The slightest defect in line or surface of trestles or track near them is promptly detected. Weak stringers will become apparent. Any unusual oscillation noted is made the subject of prompt personal examination by the Supervisor.

Of the roads reporting three, with a mileage of 14,931, use ballasted trestle to a greater or less extent. Two of these use creosoted piles and timber throughout, and one does not use treated timber or piles. The depth of ballast varies from 4 in. to 10 in. The distance between side timbers varies from 10 ft. to 14 ft. One road reports cost of ballasted trestles to vary from \$6.50 to \$8 per linear foot. Timber untreated. Through the courtesy of the Chief Engineer of the Atchison, Topeka & Santa Fe, the Committee presents the following table of cost for ballasted trestles. All piles and timber creosoted, five piles to bent; floor 15 ft. wide; floor timber,

12 x 12 and 10 x 12; span, 14 ft.; depth of ballast, 10 in.; caps, 12 in. x 12 in. x 16 ft.

Cost Per Lineal Foot of Creosoted Ballasted Trestles.

	No. 535. Length 280 ft. Height 20 ft. Piles Av. 35 ft.	No. 536. Length 996 ft. Height 19 ft. Piles Av. 36 ft. 4 in.	Average of Trestles Two Trestles. Length 32 ft. 1 in.
Cost of Piles.....	\$5.47	\$4.58	\$5.02
Lumber.....	5.01	5.02	5.01
Boots.....	.22	.20	.21
Cross-Ties.....	.24	.24	.24
Ballast.....	.30	.27	.28 1/2
Labor (All Kinds).....	2.14	1.64	1.89
Creosote.....	.01	.00	.00 1/2
Total per Lin. foot.....	13.39	11.95	12.66

Of 27 roads reporting 20 use yellow pine for stringers, six use Oregon or Douglas fir. A number of roads use whiteoak, white pine, cypress, etc., but yellow pine is generally used and in double lengths. The heaviest stringer reported is used by the Terre Haute & Indianapolis—three pieces, 8 in. x 20 in. by 16 ft. under each rail and 8 in. x 12 in. x 4 ft. corbels. The average length of span is 14 ft. 4 in. In general, three stringers to the rail are used where span is 14 ft. or more, and two to the rail where span is less than 14 ft. Double-length stringers are almost invariably packed with cast-iron washers or separators. Single-length stringers where no corbels are used have a packing block about 4 ft. long packed between them and notched over caps.

Discussion.

Mr. O. Bates, Consulting Engineer—I was compelled, on account of my health, to give up the committee work. I recognize that with the outline furnished to this Committee it would do a great deal of good if the work was properly distributed. Therefore, I appointed the sub-committees, which you will see on the first page of the report, and after that I was compelled to withdraw from any active work on the Committee. I wish to say that this is a "progress" report. All of the members have been busy; so busy that they could not give proper attention to so important a subject as this, and even if they had tried they could not have made and finished the report on a subject embracing as much as this one does, within 12 months. There are some things in here, like the specifications for bridges, which will require a great deal of study, and I would be sorry to see them approved and adopted.

President Wallace—We will take up, first, the report on the subject of the sub-committee on pile and frame trestles. Pile and frame trestles are a very important feature of our structures, and among roads in the Middle West and South and in the West they make up the largest percentage of bridges. I know of one road in the Middle West that has about 5,500 miles of road, and it has 96 miles of wooden trestle bridges. The question of the future maintenance of this large number of trestles is going to be, in a short time, a very serious one; and there is one point that the Committee has failed to dwell upon, and that is in regard to a method of replacing these long pile or wooden trestle bridges with some work of a permanent character, that will not be unduly expensive. For instance, we have, particularly in the Middle South, streams that are 50 or 100 ft. wide at ordinary stages, confined between bluff banks 15 or 20 ft. high, and with low-flood adjoining land probably three-quarters of a mile in width. These floods only prevail one or twice in a season, but when they do come they are high; and these bottom lands or flood lands are crossed by the long bridges of pile or timber trestles.

That is a very important question, it seems, and I would like to know what we are eventually to do about those trestles. We cannot go on forever renewing them with wood. Timber is becoming scarcer and more expensive year by year, and it would seem to me this is quite a question, as to how we can economically and permanently treat these places; whether we can enlarge the waterways in the center and fill up these and confine the streams, trusting that they will scour out and widen a deeper channel, or whether we shall use short girders, with concrete, or whether we will use some form of steel trestle work; and if we do fill up these structures and regulate the channel, what the effect will be in regard to damages to land owners. On the road with which I am connected we have had some serious cases of that kind. We have filled up a great many trestles, and while we don't think we have materially changed the conditions, we have been subjected to very annoying and, at times, expensive suits for damages on account of our changing the established regime.

Mr. Bates—I have been a little discouraged in stating the pile bridges that our company has, but I am free to say that since my connection with the company we have reduced that mileage 44 miles; that is to say, we have filled up 44 miles of pile bridges. Our experience has been that we have filled those 44 miles for about the same cost it would require to renew them, because we have long bridges, where the cost of embankment is much less thereafter than the cost of renewing with the pile bridges. The average for the whole amount, I will venture to say, was at a cost not to exceed that of renewing the pile bridges. I will say, furthermore, in reference to the reduction of waterways, that there have not been as many washouts due to the reduction as occurred of old, and the culverts on the original

construction of road show that our judgment in doing this has been very well confirmed.

Mr. H. McDonald, Chief Engineer Nashville, Chattanooga & St. Louis—The Committee in reporting on the question of covering stringers with galvanized iron, seems to have confined itself entirely to the benefits that are derived from the protection of the timber from decay. But it might be well to call attention to the advantages of protection against fire also. There is always a considerable amount of decay in some of the stringers on a road, in advance of the rest of the stringers; and most fires occur at that point. Galvanized iron, if applied in that way, as long as it is sound between the ties, will protect the stringers against fire. The presence of the tie on top of the structure will, of course, cause moisture to settle under the tie and cause the iron to rot out quickly, but as it only amounts to a cost of about 20 or 25 cents a linear foot to recover the entire stringers of the trestles with galvanized iron it would be very well, in my judgment, to use it for the protection against fire.

President Wallace—The average cost of trestle bridges in the Mississippi Valley, from 10 to 15 ft. high, runs about \$5 to \$6 per linear foot of track. That is, in the use of the present standard. In the North, where there is an increased cost in the price of timber, it increases, and it is also increased in proportion to the height of the structures.

Mr. D. D. Carothers, Engineer Maintenance of Way Baltimore & Ohio Southwestern—I want to inquire as to how much additional life is secured in the stringers which have metal coverings. The report refers to the life of the metal covering, but it does not state how much additional life they could secure for the stringers. On our road we have two standards, being two roads consolidated. On one we have spans with 12 1/2 ft. centers or bents, and on the other we have 15 ft. centers. I have just decided to reduce that. As the gentleman just remarked, we find a good deal of deflection in the stringers. While they are amply strong it is almost impossible to secure a smooth riding track over long trestles. We have decided to reduce the length of our spans to 12 1/2 ft. centers.

President Wallace—Another question is about the length of stringers. I believe the greater number of roads use a long stringer in order to break joints, and the increased cost of stringers 30 to 33 ft. long over those 20 to 25 ft. long has got to be a serious matter, particularly owing to the shape of our standard stringers, which are 8 or 9 x 16 in.

Mr. A. S. Markley, Chicago & Eastern Illinois—Some 10 or 12 years ago we were covering our stringers or trestles with galvanized iron and our experience has been that it is not practical, for the reason that trains running over the trestle the ties wear the iron in two. This was more pronounced on the under-floor beams on our bridges than it was on the ties themselves, though it did it in both places; and the track crawling would carry the iron with it and consequently would open the joints of the iron. In some cases fire would get in the joints and we found it almost impossible to get it out, much more difficult than if there was no iron there at all. Where there is sound timber I hardly think a locomotive will ever set the bridges on fire, and in nine cases out of ten it catches in the ties first.

Fifteen or 20 years ago if we did not have a washout, or three or four, in the time of high water, we thought there was something wrong. In the past 10 years, or since that time, we have been continually renewing our trestles with permanent structures; and I am glad to say in the last ten years I cannot call to mind that we have had a single washout.

President Wallace—If there is nothing further on the question of wooden trestles we will call up the report of the sub-committee on specifications.

T. L. Condon, Consulting Engineer—The report itself, outside of the specifications, is very brief. Reference is made to the data collected regarding specifications now in use, and you will find the figure referred to in the pamphlet. By glancing at that you will notice the specifications of several roads for the same class of material. Now, in explanation of why this report has been presented in the form it has been, I would say that personally I am a member of the International Association of Testing Materials, and that association has been doing some work in the line of standard specifications. I have seen fit to present before this Association the original form of those specifications of the International Association, making modifications or suggestions regarding points that seem desirable.

Now, if there were recognized standards used, the manufacturers would know what they were, without having to refer to the specifications. That would keep their product up. The whole question is this. Then the material would be fitted to the specifications, and we would not have to fit the specifications to the materials. And the point is, if they simply could be more uniform in railroad materials I don't doubt for a moment that there would be more uniformity in material delivered for bridges.

Mr. O. Bates—It is of the first importance that we should all agree upon specifications and each one of us can afford to waive something that we want in order to have uniform specifications, because we will get the product of the mill in any case and we should stand together to raise that. I have recently looked specially into the subject of mill inspection, and one thing that was impressed on my mind was that we were going to get what the rolling mills make. The specifications of our road were in some respects different from the specifications of

a good many roads, but I got just exactly the same material that the other roads did, and they got exactly what I got. We would like to get a good commercial product. We do not need anything extra fine if we know what we are getting, because we can all design bridges, and if we know what the material is to be we can make the right kind of bridges.

President Wallace—The whole matter is this: There are three elements. The manufacturers, the engineers and the users and buyers of the product, who do not care what the phosphorous is, but who want their bridges to give the maximum strength, lasting for the longest time, for the least expense. Now, the primary question is, how we are going to get these elements together? The first thing we want is the specifications, and the next thing we want is the enforcement of the specifications. While the manufacturers may be able to ignore the specifications of one engineer, if the engineers as a body adopt specifications, and seal them with the stamp of their approval, we will be a good deal more liable to get a good product than we would if we do not adopt specifications and do not set the seal of our approval upon the series of specifications.

C. S. Churchill, Engineer Norfolk & Western—I have not had trouble in getting our specifications adopted. I do not know that it is exceptional, but I do think it is because I have not tried to keep one specification over a long period of years. I see no reason why a specification recommended by this body could not be changed in the course of two or three years; and it is my understanding that it is the whole idea of the Association that it shall present the best practice at this date, and to carry out this idea and to get the best results.

Mr. C. A. Wilson, Cincinnati, Hamilton & Dayton—I make a motion that the specifications be referred back to the Committee for a further report, giving the members a chance to go over in detail the specifications submitted to us before we indorse them. Also to obtain an expression of opinion as to the advisability of their adoption. Carried.

William B. Hanlon, Chief Engineer Cleveland, Lorain & Wheeling—The Committee takes up the report on docks and wharves, particularly as to the docks receiving ore for shipment on the lakes, and nothing is said about the docks receiving the ore after it is taken out of the vessel. At Lorain we handle about one-ninth of the output that is shown here; handle about one-ninth of that over our dock; and a great deal of that is stored in piles back of the dock front, and when building a dock we have to provide for a way to ship it out. In 1899 we built some 649 ft. of dock by using iron pipe—8-in. gas pipe. We made a test along the dock front as to the depth of the shale by building a chute 10 ft. in the shale for the minimum depth of the pipe in the shale and placed the pipe with 8 ft. centers. The pipes were 36 ft. long and came up to the dock front 7 ft. above the top of the water. The front of the piling is placed close enough to provide for the weight of material, including the weight of an engine. We built 640 ft. of that in 1899, and last year we built 540 ft., using 10-in. I beams in the place of 8-in. pipe. The 8-in. pipe cost about \$30 a linear foot against a timber crib docks of the Government built adjoining it that cost about \$50 a linear foot. The dock has been in use almost two seasons and is standing very straight and in good line to-day. The dock built with I beams I like much better. It has not been tested yet, only being just finished at this time, but we expect the cost of it not to exceed \$30 per linear foot. To get the gas pipe down into the shale we drilled a 10-in. hole for the 8-in. pipe. The minimum depth was 10 ft. in the shale and that ran up to 14 ft. on account of the irregularity of the bottom of the river. The 10-in. I beam requires a hole about 13 in. in diam. The cost of drilling the holes and setting the pipe was \$24.50 per hole; drilling the holes for I beams and setting them, and putting concrete in and around that to the top of the shale was \$30 a hole.

President Wallace—I desire to call the attention to a peculiar form of wharf construction along the Mississippi and Ohio Rivers, in which inclines are used not to place cars on boats or barges for transfer but on which the cars are placed in order to transfer the loads from the barges to the cars. There are several points on the Ohio and Mississippi Rivers at which a series of transfer tracks has been constructed at different elevations, 5 ft. apart. These tracks are level for quite a distance after they leave the incline tracks, so that the entire train of cars can be placed on the tracks as close to the surface of the water as possible in order to make this transfer connection, and as the water rises another track will be used. One of the great troubles with the car ferries on the Lower Mississippi River is the rise and fall of the river and the changing of the bars and the cutting in of the banks, etc. The Illinois Central has a transfer at Helena, one at Grave's Point, one at Cape Girardeau, one at Brooklyn and another at Evansville, Ky. At some of these points, and particularly opposite Helena, Ark., it has been necessary to obtain two and sometimes three different inclines, one for use during low water and another for use at its intermediate stage, and another for use in extremely high water; but every now and then these have to be changed in their location on account of the change in the channel from the cutting of the banks or the cutting of the sandbars.

Water Supply.—The Chairman of this Committee is Mr. W. E. Dauchy, Chief Engineer of the Chicago, Rock Island & Pacific. The report is principally a summing up of the practice of various roads as collected by the

Committee. Very little is said as to the treatment of water for purification. A few extracts from the report and discussion follow:

Modern conditions on first class roads call for 10-in. standpipes with flexible joint, giving some 4 ft. vertical movement to end of spout. Such a standpipe, with 100 ft. of 10-in. pipe between it and bottom of tank, with masonry pit drainage and sawdust frost protection in wooden box under tank on 20-ft. posts, will add to cost of low tank and spout some \$700, other things being equal. With this against it, pretty much everything else is in its favor—better head, clearer view, freedom from danger of serious damage from accident of foundation being knocked from under tank, less liability of accident to trainmen, less sump and ice on track, etc.

Track tanks—an expensive luxury where not especially needed—become pretty nearly a necessity on a long road, crowded with heavy fast trains, saving as they do time of stops for water. From 10 to 25 per cent. as much water as goes into the tank of engine is pushed out by spout and wasted, depending upon form of spout and speed of train. They are hard to heat satisfactorily; it must ordinarily be done with steam, and generally with lack of uniformity along the tank. The cost of heating plant will vary from \$1,500 (where the boiler in pumphouse is large enough to furnish the steam required) to twice as much or more (where an independent plant has to be put up); and the operating expenses will vary from the mere cost of additional coal to supplies and payroll for additional plant. They are hard to maintain; ordinary paints last less than one season under the water. An asphalt coating, put on hot during hot summer weather, is probably the best treatment for them.

The cost of pumping water for railroad use probably varies more than for any other purpose, as the conditions are so infinitely various, as in amount of water needed, kind of power available, quantity and quality of supply, etc., so that any kind of a general estimate of cost is futile; it will continue to vary from almost nothing—with water rams and wind mills under favorable conditions, pumps on natural gas lines, etc.—to the cost of pumping by hand.

The Association of Railway Superintendents of Bridges and Buildings have a committee report in their *Proceedings* of the ninth annual convention (1899) on the "Best and Most Economical Plant for Pumping Water for Water Stations," in which they attempt to compare the cost of pumping by steam and gasoline. The conclusion they reach is that gasoline at 10 cents per gal. is equivalent in value, as a fuel, to coal at 60 cents per ton (of course, this does not consider duty of pump), and that at these relative values for fuel the only economy in favor of gasoline is saving in wages of pumper. Many gasoline engines are run by section foremen, station agents or other men whose wages can be charged to something else, and if these men can learn to properly run the gasoline engine and will take proper interest in it a marked economy may often be effected.

Supply from city waterworks when water is good and supply is sufficient and reliable and price is satisfactory is a very comfortable solution.

The best pumping plant is none at all. If a gravity supply is available at reasonable cost, it is hard to beat. When the flowing water is too low to reach the tank it may perhaps still be utilized as a water power, either through a wheel and pump or hydraulic rams. Rams are on the market with a capacity ranging up to 300 gals. per hour which can be delivered from 20 ft. to 120 ft. above the ram, according to head available, the head required being approximately one-seventh of the height to be raised, and the amount delivered being approximately one-twelfth of the supply to the ram. They can be arranged in batteries of any number of rams, working into a common discharge pipe, but working entirely independent of each other. Like most other good things, however, their application is limited.

Steam pumping plants should be carefully designed according to conditions at each particular station. As a general proposition it is safe to say that no gasoline engine should be depended upon that does not have intelligent supervision at least once every six hours, when at least one hour should be given to taking proper care of it. Where it is desired to transmit power to a pump situated at a distance from the source of supply, compressed air furnishes a good means. Edward A. Rix gives a valuable article in the *Journal of the Association of Engineering Societies* for October, 1900, on this subject.

Many schemes have been devised from time to time to meet certain conditions, of which the submerged plant of Mr. McHenry is an ingenious instance, and several kinds of steam syphons, etc., but their usefulness is in most cases at best limited to the special conditions for which they were designed, but as at most water stations special conditions will always obtain, perhaps but little more than this can be said of any other kind of machinery.

Discussion.

W. E. Dauchy, Chief Engineer Chicago, Rock Island & Pacific—I wish to call attention to this paragraph: "It is the consensus of opinion of the Committee that the work should consist of a thorough canvass of the different methods in practice by the railroads of the country, and after such a canvass to recommend certain methods as being the best adapted to meet the different requirements." I wish to say that as far as the reports of the first two subcommittees are concerned they are simply presented here for the purpose of discussion and to bring

the matter before the Association, as being the consensus of opinion of the Committee.

Mr. A. S. Markley, Chicago & Eastern Illinois—We have established two filtering plants where, in both cases, after using the water we found a great deal of mud accumulated in the boiler and on the flues. We installed two filters at a cost of \$3,800 apiece. Each filter would filter about 7,500 or 8,000 gals. of water per hour and that has been ample for our demands. A test was made as to the cost of filtering water the test extending over 99 days, beginning with Nov. 10, and in that time we expended \$33.42 for cracked potash and alum, which is the only ingredient used in settling the water. Of course you understand that the water is pumped through gravel, in order to aid the filtering, and the alum is supposed to gather up the particles and collect them together. Every few days the filters are washed out, taking from 5,000 to 8,000 gals. of water to take the sediment out. On a basis of 25,000 gals. a day each, we assume that to be a fair quantity, it would cost 1.25 cents for 1,000 gals. of water. So far we have had good results from the plants and I believe it is intended, from what I have gathered from correspondence from Mr. Dawley, that the company intends to put up other plants wherever necessary.

As for pumping water we use a great many gasoline engines. We have 19 engines now, and through various tests we have made we find we are able to pump water for about 1 cent per 1,000 gals. That is, for fuel. For labor we make a greater saving.

Mr. F. A. Bryan, Michigan Central—Mr. Markley spoke of the application of gasoline engines for pumping water. I have suggested the use in a number of places of electric motors. We have them in several places for our elevators and they work very successfully. Manufacturers and others engaged in commercial purposes have applied the electric motor to pumping very successfully. I have in mind two or three plants that work very successfully at scarcely any expense at all and I would like to know very much whether any of the railroads have adopted the motor. I have not made any investigation as to the cost, but the equipment costs a little more, the pumping and gearing about the same as the steam engine pump, and our experience has been that the cost is decidedly cheaper than the gasoline engine. I refer, of course, to our plants in towns of 5,000 or so. There is hardly a town now of 5,000 but what you find a motor plant or power station, which runs 24 hours a day.

President Wallace—Our experience on the Illinois Central with artesian wells has been very unsatisfactory as to quality of water. There are hardly any two of these wells that have shown the same chemical analysis, or in which the water would be benefited by the same treatment, and our policy now is, wherever possible, to construct reservoirs even if we have to go to a large expense to do so. Although we only have one or two of such reservoirs now in existence it seems to me that ultimately, and particularly through the West, some means must be adopted eventually to enable us to use a purer quality of water. The improved drainage over the cultivated country, of course, now causes the water to run off faster than it did a few years ago and the demand by the roads on account of more freight trains and large boilers has increased from day to day and year to year, and it is going to be a very serious question.

Mr. Dauchy—I don't believe there is a single question coming before this Association for discussion upon which there is a more varied opinion than there is on this question of water supply and character of water. It all arises from the different experiences of the members in different parts of the country. The question of water supply varies so in different parts of the country that our opinion is based and formed upon our individual experience. Mr. Wallace speaks of the question of reservoirs. That is all right in a country where the rainfall is plenty, but my individual experience has been that where water is scarce on the surface of the ground, looking for it below the surface is equally useless.

(TO BE CONTINUED.)

Train Accidents in the United States in February.

COLLISIONS.

Rear.

1st, at Wallace Junction, N. Y., a westbound freight train of the New York, Chicago & St. Louis was run into by a passenger train of the Pittsburgh, Bessemer & Lake Erie, and the caboose was wrecked and destroyed by fire. The freight conductor was burned to death.

2nd, on Western & Atlantic, at Graysville, Ga., a freight train standing at the station taking water was run into at the rear by a following freight drawn by two engines. Two engines and four cars were wrecked. Two trainmen and one other person were killed and three trainmen were injured.

3rd, on Gulf & Ship Island road, near Carroway, Miss., a work train ran into the rear of a preceding work train, badly damaging the engine and several cars. One brakeman was killed and two other employees were injured.

5th, on Erie road, at Carrollton, N. Y., eastbound passenger train No. 10 ran over a misplaced switch and collided with a preceding freight, wrecking the engine and caboose. One conductor and one engineman were killed. The passenger train ran past a distant and a home signal set against it.

6th, on New York, Ontario & Western, at Hurleyville, N. Y., an engine drawing a snow scraper ran into the rear of a passenger train standing at the station, badly damaging the rear car. Four passengers and two trainmen were injured. The injured persons inhaled steam from ruptured heating pipes, and one of the passengers died from this cause. It is said that the passenger car

and the express car contained stoves, which were overturned and set the cars afire. The collision is said to have been due to misunderstanding of dispatchers' orders.

12th, on New York, Ontario & Western, near Apex, N. Y., the passenger car of a mixed train broke away men were injured. The injured persons inhaled steam from the front portion of the train and afterward ran into it on a descending grade. One trainman was injured.

12th, 5 a. m., on New York Central & Hudson River, at Jordan, N. Y., rear collision of westbound freight trains on track No. 3; two cars were derailed and at once fouled track No. 2 immediately in front of passenger train No. 35 running in the same direction. The passenger engine smashed the derailed cars, but was not itself seriously damaged. An eastbound passenger train on track No. 1 was slightly damaged. The freight collision appears to have been due to careless running under a permissive block signal. A freight train ran into a caboose and light engine and pushed both of them forward into a freight train ahead, derailing, besides the light engine and caboose, the caboose and three cars of the train ahead. The debris was scattered on all four tracks.

13th, on Northern Pacific, near Oriska, N. Dak., an empty engine ran into the rear of a preceding freight, wrecking engine, caboose and two cars. Three drowsers were injured.

13th, 11 p. m., on Bangor & Aroostook, near East Dover, Me., a snow plow train ran into the rear of a preceding passenger train, damaging one passenger car and injuring one passenger. The snow plow train ran past a red light at East Dover, and the passenger-train brakeman was not back far enough.

14th, night, on Kansas City Southern, at Ruliff, Tex., a passenger train ran into a water car standing on the main track and the engine, first two cars and the water car fell off a trestle bridge to the ground, 25 ft. below. The engineman was killed and the fireman injured.

18th, 5 a. m., on New York, Chicago & St. Louis, at Vermillion, Ohio, a freight train ran into the rear of a preceding freight, wrecking the engine, caboose and several cars. Three trainmen were injured.

18th, on Central Vermont, at Montville, Conn., a passenger train ran into the rear of a preceding freight, wrecking the caboose. A brakeman was injured.

21st, on Pittsburgh, Ft. Wayne & Chicago, at Shields, Pa., a passenger train ran into the rear of a preceding freight, wrecking the caboose and three cars of coke, and overturning the engine. The engineman and fireman jumped off and were injured. The passenger train was running under a permissive block signal and, it appears, was not properly controlled.

23rd, on Pennsylvania road, at Bristol, Pa., a freight train ran into the rear of a preceding train of empty passenger cars. A flagman was killed and three trainmen were injured.

27th, on Pennsylvania road, near Chaffee, N. Y., a snow plow ran into the rear of a preceding freight train, wrecking the caboose and two cars. One employee was killed and another injured. It is said that the freight had become stalled in the snow and that a flagman was sent back with stop signals, but there was a blinding snow, and it appears that his signals were not seen by the men on the plow.

28th, on Lake Shore & Michigan Southern, at Willsboro, Ohio, a freight train which had been unexpectedly stopped was run into at the rear by a following freight, and 18 cars were wrecked. Two of the cars were loaded with oil and took fire.

And 14 others on 14 roads, involving 1 passenger train and 24 freight and other trains.

Butting.

4th, on Western & Atlantic, near Bartow, Ga., butting collision between an eastbound passenger and a westbound freight; one engineman and one fireman injured.

4th, 10 p. m., on Lehigh & Hudson River, at Franklin Junction, N. J., butting collision between a freight train and an empty engine, damaging both engines and 14 cars. The empty engine, having been reversed and deserted, ran back some distance into its own train, and damaged six cars. One engineman and one fireman were injured. There was a blinding snowstorm at the time.

6th, 4 a. m., on Illinois Central, near Ripley, Tenn., butting collision of freight trains, wrecking both engines and 15 cars. One engineman and a tramp were killed and one fireman was injured.

8th, 2 a. m., on Western & Atlantic, at Rogers, Ga., butting collision of freight trains, one of which was drawn by two engines. Four trainmen were injured. The northbound train had stopped, according to the dispatcher's order, to meet the southbound, and the latter ought to have entered the side-track, but it approached at uncontrollable speed and continued on the main track until it met the other train.

11th, 4 a. m., on Baltimore & Ohio, near Tunnelton, W. Va., in the Kingwood Tunnel, butting collision between a freight train and an empty engine near the middle of the tunnel. Both enginemans and both firemen were injured. The road was blocked for 10 hours.

11th, 11 p. m., on Illinois Central, at Fulton, Ky., butting collision of freight trains, badly damaging two engines. One engineman was injured.

14th, on Baltimore & Ohio, at Yough, Pa., butting collision of freight trains; one fireman injured.

16th, on International & Great Northern, at Lewis, Tex., an eastbound passenger train ran over a misplaced switch and into the head of a westbound passenger train standing on the side-track. Both engines were wrecked and several cars badly damaged. Several passengers were injured.

21st, on Pennsylvania road, near Bordentown, N. J., butting collision of passenger trains, wrecking both engines and several cars. Ten passengers and two trainmen were killed and four trainmen and 30 or more passengers were injured, one of the passengers fatally. The northbound train had been ordered to wait at a side-track near Bordentown for the second and third sections of the southbound, but it waited for the second section only. This collision was reported in the *Railroad Gazette* of March 1.

And 8 others on 8 roads, involving 16 freight trains.

Crossing and Miscellaneous.

1st, at Memphis, Tenn., collision of freight trains of the Illinois Central and the Southern, at the intersection of the two roads. A man walking along the track was injured.

1st, night, on Chicago, Burlington & Quincy, near Kewanee, Ill., the caboose of a freight train broke away and came to a standstill on the main track. The rest of the train continued on its journey and, after it had run some distance, the rear freight car, a flat, also broke away and came to rest. On reaching the next station the engine was cut off and was run back for the caboose, but it collided with the platform car and both car and engine were damaged.

6th, on Manhattan Elevated, at 145th street and Eighth

avenue, New York city, collision between an empty engine and a passenger train.

7th, on Pittsburgh, Fort Wayne & Chicago, at Allegheny City, Pa., collision of passenger trains; two passengers injured.

9th, on Southern Railway, at Atlanta, Ga., a switching engine backed into a passenger train, and both engines were badly damaged. Three trainmen were injured.

10th, 11 p. m., on New York Central & Hudson River, at Geneva, N. Y., collision between a freight train and a switching engine, badly damaging both engines. The boiler of the switching engine exploded and the explosion damaged the other engine and the cars.

13th, 2 a. m., on Pittsburgh, Ft. Wayne & Chicago, at Plymouth, Ind., two locomotives of a freight train, coupled together, which had been detached and run forward to take water, were not properly controlled on their return, and collided violently with the front car of the train. One fireman was killed and two other trainmen were injured.

18th, 1 a. m., on New York Central & Hudson River, at Akin, N. Y., collision between a freight train backing out of a side-track, with an eastbound freight train on track No. 4 and a westbound freight on track No. 2, wrecking three engines and damaging many cars, some of which fell into the Mohawk River. One engineman, one fireman and one brakeman were killed and two other trainmen were injured.

21st, on Lehigh Valley, at Stafford, N. Y., a westbound freight, pulling out of the eastbound track was run into by an eastbound freight, making a bad wreck and blocking both tracks. There was a blinding snowstorm at the time. One fireman was killed. It is said that the eastbound train ran past a block signal set against it.

22nd, 11 p. m., on Louisville & Nashville, at Birmingham, Ala., collision of switching engines; three trainmen injured.

26th, 1 a. m., on Erie road, at Salamanca, N. Y., a freight train collided with a switching engine; two trainmen injured.

26th, 8 p. m., near Jacksonville, Fla., a passenger train of the Seaboard Air Line collided with a freight of the Atlantic, Valdosta & Western at the crossing of the two roads; one man injured.

28th, on Pennsylvania road, at Coal Valley, Pa., a westbound freight train pulling out of a side-track between the main tracks ran toward the south instead of the north track, as intended, and collided with an eastbound passenger train, badly damaging both engines and several cars. The wreck took fire from the coals and two passenger cars were burned up. There was a high wind at the time and a number of buildings were set afire. The engineman and mail messenger on the passenger train were killed and one fireman and one passenger were injured. It is not clear how the switch leading to the diverging tracks from the siding came to be set for the south instead of the north track. The freight had backed into the siding from the north track and on going out the engineman supposed that the rails were in position for him to return to his own track, but it seems likely that the switch had not been turned from its normal position, which is toward the south track; the freight, in backing in, appears to have crowded through the switch while it was in the wrong position.

And 17 others on 10 roads, involving 6 passenger and 27 freight and other trains.

DERAILMENTS.

Defects of Roadway.

1st, on Union Pacific, near Hardin, Colo., westbound passenger train No. 3 was derailed by a broken rail, and the baggage car and two passenger cars were ditched. Three trainmen and 15 passengers were injured.

9th, on Southern Pacific, at Snowdon, Cal., a freight train was derailed by a defective switch, and the fireman was fatally injured.

11th, on Chesapeake & Ohio, at Malden, W. Va., a passenger train was derailed at a defective switch and the baggage car and one passenger car fell down a bank. Two passengers and one trainmen were injured.

16th, 1 a. m., on Texas & Pacific, near Dallas, Texas, a freight train was derailed by a defective switch, and the engine was overturned. The engineman was killed and a brakeman was badly injured.

26th, on Wabash road, at Millersburg, Ind., westbound passenger train No. 9 was derailed by a broken rail, and six cars were ditched. One sleeping car fell down a bank. One trainman and 30 passengers were injured.

28th, on Chateaugay road, near Lyon Mountain, N. Y., a passenger train was derailed by spreading of rails. Two trainmen were injured.

And 4 others on 4 roads, involving 4 freight trains.

Defects of Equipment.

3rd, on Vandalia Line, near Bridgeport, Ind., a freight train was derailed by a broken wheel, and 10 loaded cars were wrecked. One brakeman was injured.

7th, on Lehigh Valley, near Phillipsburg, N. J., a freight train was derailed by a broken axle and eight cars were wrecked. A brakeman was injured.

7th, on Lehigh Valley, near Phillipsburg, N. J., the locomotive of a passenger train was badly damaged and derailed by the breaking or loosening of a main connecting rod, and with the two foremost cars, was pushed across a bridge by the momentum of the train and a considerable distance beyond the bridge. Two of the cars fell down a high bank just after crossing the bridge.

9th, 11 p. m., on Maine Central, near Brunswick, Me., the locomotive of a passenger train was derailed by the breaking of a connecting rod. The engineman was injured.

11th, on Erie road, near Wren, Ohio, a passenger train, consisting chiefly of five carloads of emigrants, was derailed by the breaking of an axle of the engine, while running at about 50 miles an hour, and the entire train was ditched. The engine fell down a bank. Nearly all of the passengers were injured, but only 11 of them seriously. The fireman jumped off and was killed and a porter was injured.

13th, on Pennsylvania road, near Emporium, Pa., a freight train was derailed by a broken axle and 18 cars were ditched. A brakeman was killed and two other trainmen were injured.

13th, on Chicago, Milwaukee & St. Paul, near Appleton, Wis., two cars in a freight train were derailed by a broken journal. Both cars ran clear of the track before stopping, and as the track was not damaged the injured portions of the train were coupled together and proceeded without delay.

16th, on Southern Pacific, near Suisun, Cal., a work train was wrecked by the breaking of a flange, and three employees were injured.

18th, 2 a. m., on Philadelphia, Wilmington & Baltimore, near North East, Md., an oil car in a northbound freight train was derailed by a broken axle, and the tank of the car fell off and derailed several other cars. It also fouled the southbound track immediately in front of a passenger train, running at full speed, and the engine

of the passenger train was derailed and overturned. The first two cars were also overturned and wrecked. The passenger engineman was killed and the fireman, baggeman and several postal clerks were injured.

And 9 others on 7 roads, involving 1 passenger train and 8 freight and other trains.

Negligence in Operating.

6th, on Northern Pacific, at Weston, Wash., a freight train of 15 cars which had become uncontrollable on a descending grade was derailed at a curve and all of the cars fell down a bank. A brakeman was killed and four other trainmen were injured.

And 2 others on 2 roads, involving 2 freight trains.

Unforeseen Obstructions.

4th, 3 a. m., on Illinois Central, at Dixon, Ill., a passenger train was derailed in a snowdrift and three trainmen and four passengers were injured.

7th, on Missouri Pacific, near Ozark, Ark., a freight train was derailed by a rock which had fallen on the track, and the engine and five cars were ditched. The fireman was injured.

8th, on Boston & Maine, near Farmington, N. H., a passenger train was derailed in a snowdrift and the engine was overturned. The engineman was injured.

8th, on Southern Pacific, near Ventura, Cal., a freight train was derailed at a point where the track had been weakened by rains, and four cars were wrecked. Two trainmen were injured.

15th, on Lehigh Valley, near Cortland, N. Y., a passenger train drawn by two engines was derailed in deep snow, and one of the engines fell into a river. One engineman and one fireman were injured.

16th, 1 a. m., on Oregon Railroad & Navigation, near The Dalles, Ore., a train consisting of an engine and caboose was derailed at a point where the roadbed had been weakened by a flood, and both engine and caboose fell down a bank. Four trainmen were injured.

17th, on Southern Pacific, near Mills City, Nev., a passenger train was derailed and wrecked at a culvert which had been undermined by a sudden freshet, and the engine and first two cars fell into a deep gully. A sleeping car and a passenger car were badly crushed at the ends, and three passengers were killed. The fireman was killed and three other trainmen were injured.

And 5 others on 4 roads, involving 3 passenger and 2 freight trains.

Unexplained.

4th, on Southern Railway, near Edwardsville, Ala., a freight train was derailed and several cars were ditched. A brakeman was injured.

5th, 1 a. m., on Newport & Wickford, at Wickford, R. I., a passenger train was derailed and the engineman was injured.

5th, on Galveston, Harrisburg & San Antonio, at Dryden, Texas, a freight train was derailed and two trainmen were injured.

7th, 8 a. m., on Erie road, near Greenville, Pa., westbound passenger train No. 5 was derailed while running at good speed, and the first two cars were wrecked. The engine was partly overturned in the ditch; and the first car, a mail car, telescoped the combination baggage and smoking car next behind it, killing or injuring most of the occupants of the latter car. Five passengers were killed and eight passengers and one trainman were injured. The cause of the derailment could not be discovered. The track (90-lb. rails) was nearly new, and was found in good condition; and there was no evidence of any defect in the cars or engine which would cause a derailment. The mail car was a long and heavy one, but it was of the same design and about the same weight as the car behind it, which it crushed. The floor of the mail car appears to have been lifted above the level of the floor of the combination car and to have been pushed back through the latter nearly the whole of its length. Both these cars were without platforms, except that the combination car had a platform (and vestibule) at its rear end.

7th, on Northern Pacific Coast road, near Larkspur, Cal., a passenger train was derailed and the first two cars were overturned. Two passengers were injured.

10th, on Southern Railway, near Tallapoosa, Ga., passenger train No. 37 was derailed, and the engine and first two cars fell down a bank. One employee was injured.

12th, on Erie road, near Atlanta, N. Y., a passenger train was derailed and one car was partly overturned. One passenger was injured.

16th, on Sherman, Shreveport & Southern, near Jefferson, Texas, a freight train was derailed and several cars were wrecked. The wreck took fire and was mostly burned up. A brakeman was killed and another man was injured.

18th, on Louisville & Nashville, near Milan, Tenn., the caboose of a freight train was derailed and the conductor was injured.

20th, 9 p. m., on Boston & Albany, at Russell, Mass., a car in an eastbound freight train was derailed, and fouled the westbound track immediately in front of a passenger train. The passenger engine was derailed and ran against the freight, knocking six freight cars off the track and damaging one baggage car.

21st, on Louisville & Nashville, at Champion, Ala., a car in a passenger train was derailed at a switch and ran against some freight cars standing on a side-track. Two trainmen were injured.

25th, on New York, New Haven & Hartford, at New Haven, Conn., a freight train was derailed and two trainmen were injured.

And 37 others on 24 roads, involving 4 passenger and 33 freight and other trains.

OTHER ACCIDENTS.

27th, 4 a. m., on New York Central & Hudson River, near Schenectady, N. Y., an empty engine, running at full speed, was badly damaged by running into the arm of a wrecking crane, standing at work on an adjoining main track. The engineman was fatally injured and the conductor and two brakemen were slightly hurt.

28th, on New York Central & Hudson River, at Cedar Run, Pa., the locomotive of a freight train was disabled by the loosening of a flue. The flue was blown out through the fire-box door, killing the fireman.

And 7 others on 7 roads, involving 5 passenger and 2 freight and other trains.

A summary will be found in another column.

The Delaware, Lackawanna & Western has lately been examining its men for color blindness and other defects of vision and for defects of hearing; and the General Superintendent has issued a circular complimenting the men on the promptness and willingness with which they responded to the order.



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EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN OPINIONS, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

During the month of March we noted, in our news columns, orders for 11,439 cars and 414 locomotives, which may be compared with 9,932 cars and 380 locomotives ordered the same month last year. Each month this year has run ahead of the car and locomotives ordered in the same time last year and there seems to be no indication of a decrease in the demand for rolling stock. In January, 1900, orders were noted for 5,524 cars and 165 locomotives, against 11,979 cars and 329 locomotives in January this year; in February, 1900, 10,543 cars and 185 locomotives against 21,593 cars and 240 locomotives in February this year, and the corresponding figures for March were given in the beginning. The March car orders are divided as follows: Box, stock and refrigerator cars, 6,456; coal and ore cars, 4,147; flat cars, 174; tank cars, 521 and passenger cars 133. Of the locomotives, 102 were for passenger, 297 for freight and 15 for switching service.

Red, yellow and green signal glasses were discussed again at the last meeting of the Railway Signaling Club, but with the usual unprofitable results. We report the meeting in another column, but have not given much of the discussion on this topic for the reason that, so far as can be judged from the stenographer's report, the remarks were too indefinite to be of value to any one who was not present at the meeting. In speaking of yellow, and what it looked like when it did not look yellow, some members appear to have had in mind a light yellow and others a dark one, though they did not say so. We call the discussion unprofitable because no one seems to have made any progress toward converting others to his view. (Though, whatever may be the views of those who discuss, one road after another adopts yellow and puts it in use.) Those who felt doubtful about the propriety of using yellow, cited two objections, one of which is easily removable and the other imaginary. The first is that greens and reds are variable. A number of signals will be found to have a variety of shades of green, or of red, or of both. Some greens look like light yellow and some reds are about the same shade as a dark yellow in a fog when the sun is rising. The answer to this objection is, make your glasses uniform. This should be looked upon as a necessity, regardless of whether one uses yellow or not. Uniformity in the lamps of each color is due to the enginemen of fast trains, whatever colors are used. We are not prepared to admit that even a pale red looks like yellow, in any fog that ever occurs around New York; but the only rational standard is to have a deep red, uniform in all signals. Uniformity is of equal or greater importance in green signals, if that color

is used as the night "proceed" signal. To demand a uniform color in all glass orders will not please the purchasing agent, as it will often narrow the range of competition and increase the cost, but the total cost for all the signals of any road is small compared with the advantage. We judge that the best glass-makers are ready to do their part toward uniformity, as one of them tells us that he is filling orders for one color at cost or less, for the sake of inducing railroads to use the best kind in all of the colors.

The second objection is that an engineman who is constantly encountering yellow distant signals which look like red home signals will some time reach a home signal (without seeing the distant), and assume that that is the distant, and therefore make no effort to stop before passing it. To make this objection worthy of attention one must admit not only that yellow will sometimes look reddish, but that red will sometimes look yellowish. We do not think this admission necessary, but for the sake of argument will assume that it is. What then? English railroads, with ten or a hundred times as many signals as there are in America, have for many years made their distant-signal and home-signal night colors exactly alike, and have had no trouble at all. Of the scores of accidents investigated by the British Board of Trade during the last dozen years we do not recall one where an engineman missed his distant signal and assumed that the home was the distant. With the thousands of train movements carried out every month in that country, about every possible kind of negligence must happen, sooner or later; and with the very thorough investigations made by the Board of Trade all peculiar and unusual kinds are pretty sure to be shown up in their true light. In the light of this great mass of experience, a discussion about the troubles likely to result from an engineman taking a home signal for a distant seems to us decidedly academic.

The reasons why we take more care and expend more money for the safety of a passenger train than of a freight are that any mishap to the passenger train is likely to be more costly, in lives or property, and to cause more shock to the feelings than one happening to a freight train. The cost argument is simple enough for any one. But a freight train accident often proves very costly, and the question frequently arises whether more effort should not be put forth to employ the best safeguards on and for all trains. The obstacles to carrying out this idea are so obvious that we need not mention them; but a recent disaster from a break-in-two in New Jersey (at Glen Gardner, March 24) serves as a reminder that one kind of freight train accident ought to be guarded against as thoroughly as if passenger trains were being dealt with; and it calls attention to the fact that the time has now arrived when such preventive measures not only should be, but can be provided. The disaster which we refer to was a fire, spread by oil from broken tank cars, which destroyed a number of buildings and caused a loss of many thousand dollars. The cause was the failure of a drawbar or coupling, the separation of the train on a descending grade, and the subsequent collision. A coupling having parted, such collisions are often inevitable, in spite of good care on the part of the men in charge of the train. One remedy is to move no cars of oil except in trains completely air-braked. Should not this be the universal rule with tanks of oil and with explosives?

The reasons why certain men have lately bought control of certain railroads are sometimes apparent and sometimes obscure. For instance, it may not be easy to understand why Mr. Hill should care to purchase the control of the Erie. It is common belief that he already controls one line from Chicago to the Eastern seaboard. However that may be, half a dozen roads are competing to take the Great Northern traffic to the Atlantic. Nor should we suppose that the stock of the Erie would be the best investment that Mr. Hill could find, regarded merely as an investment. We cite this merely as an example of a good deal that is going on and that is hard to account for. Men's motives are complicated, and doubtless a number of things enter to explain the recent changes of control. But there is one great element that we have not seen mentioned by the financial writers, namely, speculation on a great social movement. The men of large constructive imagination, those whom we call in plain language long-headed men, see clearly a fact which a great

many of us have seen and talked about in the abstract for a number of years, namely, that the consolidation of the railroads into a few great combinations is inevitable. With us this is a tendency; with the men of constructive imagination and of executive power it is a fact, and what is more natural than that they should proceed to capitalize this fact? In this way we may account for the purchase of properties which are not important outlets or tributaries to the lines now controlled by these gentlemen and which are not good investments merely as investments. As parts of great aggregations these lines may become good investments, either through their earning power or to trade with.

The Effect of Boiler Scale.

The report on water service, presented at the last meeting of the Engineering and Maintenance of Way Association, ended with a letter on boiler scale from the Green Bay & Western. The committee says: "The conclusions reached being quite at variance with the general ideas upon the subject, the committee has decided to include the letter in this report." Such part of this as relates to boiler scale is given on another page, and it may be noted that the letter was written in February. As a somewhat similar letter by Mr. W. H. Bryan, of St. Louis, was published in the January number of another paper, we give that also; the similarity of thought and expression in these two letters is rather marked. Mr. Bryan's letter was doubtless written first. We differ in opinion from both writers.

It is quite true that exact data about the effect of boiler scale are meager. But we have never seen any tests, reported fully enough to enable one to judge of their merits, which showed that scale has little effect on the evaporation, while reliable tests have shown the contrary. This is leaving out of question all of that class of evidence which is simply based on general impressions gained by working around boilers which may or may not be of value.

Those who are interested in the subject will find a full account of some careful experiments made for the Illinois Central with a locomotive boiler and described by Prof. L. P. Breckenridge, of the University of Illinois, in our issue of January 27, 1899. The tests were made with the special object of determining the effect of scale on the evaporation. The standard method of conducting boiler tests was followed with the engine at rest in the round house, and two trials were made under each condition as a check on the result. The boiler when first tested had been in service 21 months and the thickness of scale varied from 1-32 to 3-64 in.; after being thoroughly cleaned the tests were repeated. The loss of efficiency due to this scale was found to be about 9.5 per cent. We are told little or nothing about the tests on the Green Bay & Western.

In fact, all boiler scale is not alike in its physical properties or in its effect upon evaporation. In Mr. William Kent's new book on "Boiler Economy," just published, he says: "The effect of scale in a boiler ordinarily is to reduce both its steam generating capacity and its economy. . . . The amount of the loss of economy due to scale deposit is often overestimated. . . . It is probable that the decrease of heat transmitted depends upon the kind of scale as well as upon its thickness, but increases at a slower rate. If the scale is dense and hard, so as to be practically waterproof, a thin coating of it may be an effective non-conductor. . . . If it is porous, as many scales are, it will allow water to pass through it to the metal surfaces of the boiler and the decreased transmission of heat will be very slight." This sounds like a reasonable and scientific statement and it comes from a gentleman who has for years made a specialty of the accurate study of boiler performance.

It may be appropriate to say a word as to a fact which perhaps partly accounts for the notion that scale has little effect on the evaporation. It is said on good authority that a locomotive when first coming out of the shops, after general repairs, often does not show as good fuel performance as it did just before it was taken out of service and when there was more or less scale in the boiler. This in some instances has given rise to the conclusion that the scale has little effect on lowering the evaporation. We imagine, however, that this condition is really due in the most part to the draft apparatus being badly adjusted when engines first come out of the shop and in any case nothing can be told accurately from the ordinary fuel records.

Unless something of a very convincing nature can be brought out to the contrary, we must continue to believe that scale seriously affects the evaporation of boilers.

February Accidents.

Our record of train accidents in February, given in this number, includes 77 collisions, 92 derailments and 9 other passenger train accidents resulted in injuries to persons were killed and 228 injured. The detailed list, printed on another page, contains accounts only of the more important of these accidents. All which caused no deaths or injuries to persons are omitted, except where the circumstances of the accident as reported make it of special interest.

These accidents are classified as follows:

		Collisions.		
	Rear.	Butting.	Crossing and other.	Total.
Trains breaking in two.....	4	0	0	4
Misplaced switch.....	1	1	0	2
Failure to give or observe signal.....	9	0	4	13
Mistake in giving or understanding orders.....	1	2	0	3
Miscellaneous.....	3	2	8	13
Unexplained.....	12	12	18	42
Total.....	30	17	30	77

Derailments.

Broken rail.....	5	Bad switching.....	1
Loose or spread rail.....	2	Runaway.....	1
Defective switch.....	3	Animals on track.....	1
Broken wheel.....	3	Landslide.....	3
Broken axle.....	8	Washout.....	3
Broken truck.....	2	Snow or ice.....	4
Fallen brakebeam.....	1	Malicious obstruction.....	1
Failure of drawbar.....	1	Unexplained.....	49
Loose ash pan.....	1		
Broken connecting rod.....	2		
Derailing switch.....	1		
	92		

Other Accidents.

Broken side rod.....	3
Cars burned while running.....	1
Various breakages of rolling stock.....	3
Other causes.....	2
Total number of accidents.....	178

A general classification shows:

Coll.	Derail.	Other		Total.	P. C.
sions.	ments.	acc'dts.			
Defects of road.....	0	10	0	10	6
Defects of equipment.....	4	18	6	28	16
Negligence in operating.....	31	3	1	35	19
Unforeseen obstructions.....	0	12	2	14	8
Unexplained.....	42	49	0	91	51
Total.....	77	92	9	178	100

The casualties may be divided as follows:

Killed:	Collisions.	Derailments.	Other	Total.
Employees.....	19	7	2	28
Passengers.....	12	8	0	20
Others.....	2	0	0	2
Total.....	33	15	2	50
Injured:				
Employees.....	52	55	3	110
Passengers.....	43	73	0	116
Others.....	1	1	0	2
Total.....	96	129	3	228

The casualties to passengers and employees, when divided according to classes of causes, appear as follows:

Pass.	Pass.	Emp.	Emp.	
killed.	injured.	killed.	injured.	
Defects of road.....	0	47	1	9
Defects of equipment.....	0	11	4	15
Negligence in operating.....	12	43	20	56
Unforeseen obstructions and malice.....	3	4	2	19
Unexplained.....	5	11	1	11
Total.....	20	116	28	110

Twenty-five accidents caused the death of one or more persons each, and 42 caused injury but not death, leaving 111 (62 per cent. of the whole) which caused no personal injury deemed worthy of record.

The comparison with February of the previous five years shows:

	1901.	1900.	1899.	1898.	1897.	1896.
Collisions.....	77	100	80	76	44	34
Derailments.....	92	121	92	97	71	91
Other accidents.....	9	5	7	2	2	4
Total accidents.....	178	226	179	175	117	129
Employees killed.....	28	38	35	22	21	35
Others killed.....	22	18	6	5	3	2
Employees injured.....	110	105	118	58	40	54
Others injured.....	118	66	48	45	41	53
Average per day:						
Accidents.....	6.35	8.07	6.39	6.25	4.17	4.45
Killed.....	1.79	2.00	1.46	0.96	0.86	1.28
Injured.....	8.14	6.11	5.86	3.68	2.89	3.69
Average per accident:						
Killed.....	0.28	0.25	0.23	0.15	0.20	0.29
Injured.....	1.28	0.75	0.93	0.59	0.69	0.83

There were four collisions and derailments in February in which passengers were killed, and the total number of passengers killed in the month is 20, an unusual number. The worst of these accidents was the butting collision at Bordentown, N. J., on the 21st, which was reported in the *Railroad Gazette* of March 1. At the hearing before the Coroner in Trenton, March 28, Conductor Sapp testified concerning the meeting order that was neglected in this case. He thought that possibly his misreading was due to the fact that the figure 3 in the order was covered by his thumb as he held the sheet in his hand. Engineman Thompson died from his injuries on March 27. Evidence given before the coroner indicated that the order in question was delivered to Conductor Sapp and Engineman Thompson by a messenger; that the order was not read aloud in the presence of the messenger, as the rule requires, and that disregard of this requirement is common.

The next most serious accident, as measured by the number of fatalities, was the derailment at Greenville, Pa., on the 7th, which we have to class as unexplained. Two other passenger train accidents resulted in injuries, to large numbers of persons, the derailments at Wren, Ohio, on the 11th, and near Millersburg, Ind., on the 26th. A disastrous passenger train derailment near North East, Md., on the night of the 17th resulted very fortunately, no passengers being injured.

Three bad wrecks occurred on lines worked under the block system, and gross negligence in regard to the very simple rules under which the signals are operated appears

to have been the principal or only cause of the collision in each case. These three were the rear collisions at Shields, Pa., and Jordan, N. Y., and a collision involving three trains at Akin, N. Y. A collision near Chaffee, N. Y., on the 27th appears to have been caused by putting too much trust in a flagman in a snow storm. A snowplow was following a freight train at good speed and the freight, when delayed, sent back a flagman, but he did not succeed in making his signals seen. There was a similar collision which, however, was not fatal, at East Dover, Me., on the 13th. Here, again, the flagman is held responsible for not having gone back far enough and the snowplow train did not keep a good lookout. These and similar cases of less importance again confirm the view that an absolute space-interval rule is the only satisfactory plan for avoiding collisions in snow storms, especially in the case of a snowplow, which not only is likely to spoil its own view, but also is likely to have a lookout man of less experience in that business than a regular engine runner.

Near Weston, Wash., on the 5th, there was a regular Rocky Mountain runaway (although this one occurred in the Cascades) and 15 freight cars were wrecked at the foot of a bank.

Eleven street car accidents were reported in February, killing one person and injuring 77.

We are told that if a soldier sleeps on guard in time of war he is liable to be shot. If a locomotive runner sleeps on duty he is liable to suffer a worse death; yet the discipline for the prevention of such negligence seems to be less efficient in the railroad service than in the military. The chance is apparently so good that nothing serious will happen—the prospect indeed seems so good that a little relaxation and rest can be indulged in without falling into complete unconsciousness—that engineers sometimes take the risk. The very heavy movement of freight on many roads during the past few months has made it necessary for many trainmen to work as many hours as possible out of every 24; and the newspaper accounts of accidents appear to indicate that a percentage of these hundreds have gone beyond the elastic limit, and have risked their trains, their jobs and their lives. We do not always incorporate this detail into our record of collisions, as we do not want to accuse any man of such neglect of duty except on clear evidence; but if we include the cases where there is well-grounded suspicion, the total of the last four months is noteworthy. We bring up this subject to call attention to the fact that the block system affords a means of preventing disasters from sleeping on duty which fits a case that no time-system can cope with, unless all trains are made of the same class. We have lately had occasion to emphasize the fact that regulations for working manual block signals provide all reasonable safeguards against a collision being caused by sleepiness of the signalman; but now we have a case where it was the engineman who went to sleep. It was on a busy trunk line, March 23. A freight train stopped for water so long that the men on another freight, following, fell asleep while they were waiting, and failed to observe the departure of the foremost train. Every one of the five men on the train got into such a comfortable position that he remained unconscious until aroused by the men from a passenger train which came near touching noses with the standing freight. The first freight had gone on its way, had reached a station and cleared the track for the express train running in the opposite direction, and the express, rightfully assuming that the second freight would, if on the main track, send out a red light (it was about 5 a. m.) went on at full speed. But the line was straight, and the passenger runner saw the freight engine's headlight in time to stop. With the block system the freight, of course, would have had the absolute right to the track, against the passenger as well as all other trains, and the passenger would have had to flag itself from the last station. Evidently, when you trust men to work very long hours without sleep, you must be extra careful what kind of men they are.

The latest curiosity from England in the way of an explanation of a collision is that an engineman took the indication of a semaphore by his ears instead of his eyes; and, making a mistake as to which one of two signals he heard, he ran into a freight train at a crossing. The incident is given by Major Pringle in his report on an accident at Bournemouth, on the London & Southwestern, December 22. The engineman at fault was running a passenger train and had been stopped at a home signal. The time was about 5 p. m. Being asked to explain how he came to start, he said that he must have seen, in his weather glass (which means, we suppose, the window in the cab immediately in front of him) the reflection of the green light from a signal behind him, which was cleared for the freight which he ran into. He thinks he must have mistaken this for the light in his own signal. Experiments were made to test the matter, and the conclusion was reached that possibly this phenomenon may have occurred; but this does not exculpate the engineman, and the report before us says that the more reasonable view of his blunder is that he heard the clatter of a semaphore arm, when it was lowered, and assumed (without looking) that the noise was made by the signal for which he was waiting. Here is the chance for the inventor of the noiseless signal. If semaphores would not clatter, runners would not have to concoct so many ingenious theories—or would have to get up something new.

NEW PUBLICATIONS.

Concrete-Metal Construction.—The *Journal of the Association of Engineering Societies* for February contains a series of six papers on Concrete-Metal Construction. Five of these papers are contributed by the Boston Society of Civil Engineers, while the sixth is by Mr. C. M. Kurtz, of the Technical Society of the Pacific Coast. Of the five Boston papers, that by Mr. Wm. D. Bullock treats upon the relative economy and strength of brick and of concrete arches for the floor system of highway bridges, as illustrated by tests upon the floor system of the Weybosset Bridge over the Providence River at Market street, in Providence, R. I., and the relative costs of the two systems. Mr. Frederick H. Fay describes a test of strength of Rapp floor arches made by the Engineering Department of the city of Boston in November last. Mr. William M. Bailey discusses the use of expanded metal and describes and illustrates its use in the retaining wall for a new dock at the United States Navy Yard, Boston, in the proposed conduit for the New Jersey Water Company, in sewer construction, in the fire-proof storehouse of the Manhattan Concrete Company, Boston, and tests of a culvert constructed on this system. Mr. M. C. Tuttle describes the Ransome system as applied to the construction of fire-proof floors of a septic tank, and describes a test of the system by Prof. Edward F. Miller, of the Massachusetts Institute of Technology. Mr. Andrew W. Woodman describes tests of the Roebling fire-proof floors and arches. Mr. Kutz's paper is a review of the history and present development of concrete-metal construction, describing and comparing the several systems. All of the papers are illustrated. In the same number Mr. J. S. Branne, member of the Engineers' Club of St. Louis, has a carefully prepared paper on "The Steel Skeleton Construction of a Tall Office Building." This paper, like the others, is illustrated, the figures showing not only the general construction but many matters of detail. Mr. H. J. Malochee, President of the Louisiana Engineering Society, discusses "The Engineering Society: Its Relations to the Engineer and to the Profession."

Street Railways.—Development of Street Railways in the Commonwealth of Massachusetts. Prepared by S. Allen and published by the Commonwealth of Massachusetts.

Mr. Allen has made a pamphlet of 25 pages with an excellent map of the state. He reviews briefly the history of street railroads in Massachusetts, dwelling, of course, more particularly upon the recent development of electric roads, and gives statistics of mileage, cost of construction and of traffic. It is somewhat surprising to discover that out of a total of 1,590.9 miles of track in the Commonwealth in 1898 only 20.6 were operated by horses. This ought to be an interesting piece of information for the citizens of New York, in which town the horse car miles run in the year to June 30, 1900, aggregated 9,812,000. The encroachment of street railroad service upon the passenger business of the steam railroads is shown by the statistics of passengers carried in and out of Boston by steam railroads. In 1893 these numbered 56,581,541 and in 1898, 48,967,457.

Up to the time of the preparation of this pamphlet the electric street railroads had been organized for passenger traffic only, but a few charters had been granted allowing the carriage of express matter and small parcels. Each year electric roads ask a general privilege to carry freight at night or to carry merchandise at any time on regular cars, and it is impossible to foretell the importance to the steam railroads of the development of express and light freight traffic on the street railroads. We should like to reproduce Mr. Allen's map showing the street railroads in Massachusetts, but that is impracticable. It indicates, however, the possibility of many long trips. The pamphlet can probably be had by addressing Mr. Allen at New Bedford, Mass.

The Century Atlas of the World.—Very many of our readers must be more or less familiar with the magnificent atlas brought out in 1897 by the Century Company, a new edition of which appeared in 1899. The Atlas contains 117 double-page maps, 138 inset maps and 43 historical and astronomical maps with nearly 200,000 references to places. It is the one instance in which American publishers have seriously attempted to produce an atlas comparable with the best work of European cartographers, and in this the publishers have succeeded. Indeed the maps are, generally speaking, better for the ordinary user in that they are not so burdened with topographical details as are the German maps. This atlas, bound in half morocco, is published at \$17.50, but it is offered to the members of the American Geographical Society and of several engineering societies at \$8.75, and we are permitted to say that it will be sold to readers of the *Railroad Gazette* at this reduced price.

The Mechanics of Materials and of Beams, Columns and Shafts. By Mansfield Merriman, Professor of Civil Engineering in Lehigh University. Ninth edition, revised. New York: John Wiley & Sons. 1900. \$4. This latest edition of Prof. Merriman's advanced textbook contains 151 articles, admirably arranged and indexed, discussing and illustrating the derivation and principles of 34 fundamental formulae of stresses from No. 1, that of simple stress and deformation, to No. 34, which is Birnie's formula for the stresses in guns. It includes examinations not overburdened with tables, but illustrated by well-selected problems treating of stresses—covering

those in beams, columns and shafts—and also treating of the strength and resilience of materials and kindred subjects. Its general plan is simple—to form a "definite nucleus in the mind of the student," giving him some useful data about the six principal materials used in construction, but not attempting to give an exhaustive discussion of any particular department of work. As an aid to the engineer its value, therefore, is in its clear and compact treatment of principles and not in any practical application of them. This ninth edition contains new matter on eccentric loads on columns, on combined stresses, on oscillations under impact, and on rollers. The seven articles on stresses in guns come naturally from a professor of a college where the students look down from their campus on one of the most modern and complete gun factories in the world, and the present tendencies of the times may give them more than a limited application. The book is a large octavo of 368 pages, excellently printed and well bound.

Transactions of the Society of Naval Architects and Marine Engineers. Vol. VIII., 1900. Quarto, 296 pages, with numerous inserted plates and tables. New York: Office of the Secretary, 12 West Thirty-first street.

The eighth volume of the *Transactions* of the Society of Naval Architects and Marine Engineers contains the papers presented at the meeting held in New York last November, with the discussion thereon, also official information concerning the Society. The Secretary is authorized to sell to the members of the Society volumes I. to IV., inclusive, at \$3 a copy. Volumes V. to VIII. may be bought by members at \$5 a copy. Of the early volumes not more than one copy will be sold to any one member.

Electric and Engineering Developments at the Close of the 19th Century.—At a general meeting of the American Institute of Electrical Engineers, held Feb. 28, Mr. William J. Hammer presented a long paper entitled "Important European Electrical and Engineering Developments at the Close of the 19th Century." This paper is now reprinted as a pamphlet and describes a number of interesting and important devices and engineering works that have been recently brought forward. Among these are the Telephonograph, The Langen Mono-Rail railroad, certain gas engines and the Cockerill development of the use of furnace gases, the steam turbine, the Ganz three-phase railroad system and the Siemens & Halske three-phase railroad system.

The Municipal Electricians.—The official report of the fifth annual convention of the International Association of Municipal Electricians, held in Pittsburgh last September, is published in a volume of 204 pages, which may be had of the Secretary, Frank P. Foster, Superintendent of Fire Telegraph, Corning, N. Y. This volume gives a sketch of the organization, with portraits of officers and directors, and describes the purposes of the Association. It gives various addresses, reports and discussions, which are of interest.

Traction and Transmission.—The proprietors of *Engineering* (London) will publish a monthly illustrated supplement under the title of "Traction and Transmission." It will contain articles on electric and other traction and transmission installations and current news of such affairs. The publication office of this journal is 35 and 36 Bedford street, Strand, London, W. C.

The Engineering Magazine.—The April issue of this magazine marks the tenth anniversary of its publication. The editor and publisher has with commendable taste refrained from making a special number, but contents himself with making a thoroughly good average number, and with a few pages of review of the history and particularly of the policy of his excellent publication.

TRADE CATALOGUES.

Hydraulic Tools, Cranes and Machinery—Messrs. R. D. Wood & Co., of Philadelphia, publish a fine catalogue for 1901, being 96 pages with a cover, in quarto size. The pamphlet contains illustrations and more or less complete descriptions of a variety of hydraulic machinery and a number of new things will be found. One of these is an automatic quick-acting punch with 50-in. gap, working up to 1,500 lbs. pressure. The automatic stripper holds the plate until the punch is withdrawn and then rises $\frac{1}{4}$ in. above the end of the punch. An adjustable stroke can be quickly altered over a range from $\frac{3}{4}$ in. to $\frac{1}{4}$ in., the same movement adjusting the stripper. There are other new features in this machine. A universal hydraulic I-beam shear is shown and described which has ingenious methods of bringing into action the knives for cutting different size beams. The actual time required to cut a 24-in. steel I beam, as noted by a stop watch, was 11.6 seconds for the down stroke, 1.8 seconds for the return stroke. The catalogue covers a wide range of machinery, including not only punching, shearing and riveting machines, but cranes of all sorts, transfer tables and finally gas works appliances. As the reader probably knows, this company has a modern specialty of gas producer plants for operating gas engines.

Steam Heat and Pintsch Light.—The Safety Car Heating & Lighting Company, 160 Broadway, New York

(also Monadnock Building, Chicago, and Union Trust Building, St. Louis), has just brought out a new catalogue. It is a volume of 152 quarto pages, in flexible covers, with indexes, numerous engravings and much useful and detailed information. The heating systems of this company are now in operation on over 8,000 cars, and the Pintsch gas lighting equipment on over 17,000 cars in America. Of course, it is well-known that a much larger number of cars are lighted with Pintsch gas in other parts of the world, but about half of the equipment of the United States is so lighted. We need not go into details as to the contents of this catalogue; it is enough to say that it covers the whole range of steam heating and gas lighting for cars, amounting to a handbook on the subject. The catalogue also describes the use of gas cooking apparatus as now installed on many cars.

Pawling & Harnischfeger, Milwaukee, Wis., have issued a new catalogue of cranes, $7\frac{3}{4}$ x 11 in., with numerous half-tone engravings. These engravings show interior views of the firm's shops, details of the cranes, and a number of installations in machine shops, foundries, steel mills, etc., in different parts of the country. The book also contains a very full description of its electric traveling bridge cranes, hand cranes and hoists and specifications for a three-motor electric traveling crane. Code words are given for use in telegraphing. This company makes a specialty of crane work and the new catalogue will be sent on application.

The American Steel & Wire Company (Chicago, New York, San Francisco and London) has issued a small pamphlet of 26 pages with a cover, being a partial list of the products of that great concern. While the list is not complete, yet it is impressive in the variety of product, running from iron ore and pig iron through ingots, billets, rods, plates, shapes, horse shoes, shafting, wire, wire nails, etc. Those who want further information can easily get it by correspondence with the nearest sales office of the company, these offices being found in a dozen cities other than those which we have mentioned.

Pacific Tours and Round the World.—The Passenger Department of the Atchison, Topeka & Santa Fe has issued the 15th thousandth of a pamphlet with the above title, the text being by Mr. Trumbull White. It is a volume of 206 pages, beautifully illustrated with photographs from pretty much all over the world, but especially from Italy and the Orient. The reader is taken across the American Continent through the Pacific to China, Japan, India, Australia, etc., then back by way of Egypt and also by South Africa and around the Horn. The pamphlet can be had from Mr. George T. Nicholson, Passenger Traffic Manager, Atchison, Topeka & Santa Fe Railway, Chicago.

TECHNICAL.

Manufacturing and Business.

The Thornton N. Motley Co., New York, N. Y., is offering for sale 20 flat cars of 50,000 lbs. capacity. They measure 34 ft. over all and are of standard gage.

Sylvester Hogan, for many years identified with the railroad supply business, has been placed in charge of the railroad department of the New York Belting & Packing Co., with headquarters in New York city.

The Consolidated Railway Electric Lighting & Equipment Co., New York city, has established a branch office in Chicago, at Room 519, The Rookery. Col. Jno. T. Dickinson, General Agent, has been placed in charge of the new office.

Universal bearings, made by the Universal Car Bearing Co., Chicago, have been specified for the 2,500 cars ordered from the American Car & Foundry Co. by the Missouri Pacific and 850 cars building by the Pullman Co. for the Rutland.

The Lorain Steel Motor Company, with a capital of \$600,000, was incorporated in New Jersey April 1 to make and deal in electrical machinery of all kinds. The incorporators are: Alfred George Brown, Emery W. Ulmair and Edwin F. Maguffin, all of East Orange, N. J.

The Chicago Pneumatic Tool Co., Chicago, state that they have just bought out a pneumatic hand drill for stone and marble boring. What doubtless will be of great interest to railroad men is the electric headlight which this company expects to put on the market during April.

At the annual meeting of the stockholders of the Continuous Rail Joint Co. of America, at its office in Newark, N. J., April 1, the following directors were elected: Robert Gray, Jr., Marcus L. Ward, George G. Frelinghuysen, Frederick T. Fearey and Fernando C. Runyon.

J. R. Patton & Co., Ferguson Block, Pittsburgh, Pa., are offering for sale considerable second-hand materials. In the list is included 74 locomotives, 465 standard-gage gondola, flat and box cars; 110 narrow-gage freight cars, 730 tons new and relaying rails, 17 steam shovels, seven hoisting engines and a lot of miscellaneous materials.

B. M. Jones & Co., 81 Milk street, Boston, Mass., sole representatives in the United States for "R. Mushet's" Special and Titanic steels and "Taylor's" best Yorkshire bar iron for staybolts, piston rods, axles, crank pins and forgings of all descriptions, announce the retirement from the firm of Frank E. Barnard. This change took effect March 31.

Wm. B. Scaife & Sons, of Pittsburgh, have a contract from the Pittsburgh Seamless Bottle Co. to design, manufacture and erect the buildings for their new glass factory at Everson, Pa. Among the larger structures are the main factory building, mixing rooms, Lehr building, boiler and engine houses. Steel frame construction is to be used throughout.

Onward Bates, formerly Engineer and Superintendent of Bridges and Buildings of the Chicago, Milwaukee & St. Paul, and his assistant on that road, Walter A. Rogers, have opened an office as civil engineers and contractors at 1603 Manhattan Building, Chicago, Ill. They offer their services as engineers to make reports and advise upon railroad and public works, and they are also prepared as contractors to build structures in masonry, steel or timber. A specialty will be made of concrete construction.

The Berlin Construction Co., of 220 Broadway, New York, and Berlin, Conn., has acquired control of the plant of the Pottsville Iron & Steel Co., of Pottsville, Pa., and will have the bridge shops ready for working in the near future. New tools are being installed and other improvements made to put the plant in first class condition. The Construction Co. reports a number of orders on hand, including orders from the United Gas Improvement Co., Standard Oil Co., Westinghouse Electric & Mfg. Co., Benjamin Atha, Harrison, N. J., and Russell & Erwin Mfg. Co., New Britain, Conn.

The Norton Emery Wheel Co., of Worcester, Mass., will build at Niagara Falls a plant for making artificial corundum. The building will be two stories high, 60 ft. x 80 ft. and fitted with one electric kiln, and six electrical furnaces, each with a capacity of three tons in 24 hours. The product as taken from the furnaces will be shipped to Worcester and ground and treated there, a new building having been added to the works for that purpose. The company has found, after a series of practical experiments extending over a period of two years, that it can make corundum commercially and that the artificial product is superior to the natural rock, being of uniform purity and always more than 90 per cent corundum.

The name of the American Steam Gauge Co., Jamaica Plain, Boston, Mass., has been changed to American Steam Gauge & Valve Manufacturing Co. In announcing this, the company says the American Steam Gauge Co. was organized in 1851, when it made only steam gages. From time to time a variety of specialties was added, and the idea in changing the name was to make it better suited to the present output of the works. Besides a number of styles of locomotive gages and valves (plain and muffed) the company makes similar devices for air-brake and steam-heating systems and marine work, as well as the Thompson improved indicator, adopted by the United States and foreign navies, and which received highest award at the Paris Exposition of last year.

Iron and Steel.

W. E. Reis has resigned as President of the National Steel Co.

The Carnegie Co., according to a Pittsburgh despatch of March 27, has an order from the Chilian Government for 16,000 tons of standard rails to be delivered within two months.

S. J. Robinson, Managing Director of W. Jessop & Sons, Ltd., of Brightside Works, Sheffield, England, is reported as being in the United States to secure a site for a steel plant.

Reuben Miller, of Pittsburgh, Pa., heretofore Treasurer, was on April 1 elected Chairman of the Executive Committee of the Crucible Steel Co. of America, succeeding Wm. G. Park, resigned.

The New York Car Wheel Works, Buffalo, N. Y., resumed work on March 30 in the new foundry which replaces the two foundries burned on March 6. The new foundry has a capacity of 250 car wheels a day.

Robert G. Wood, Vice-President of the American Sheet Steel Co., and Manager of the McKeesport Iron Works, has resigned, and is succeeded by Percifer F. Smith, heretofore in charge of the Wellsville Plate & Sheet Iron Works.

Litigation on Magnesia Covering Patents.

The Keasbey & Mattison Co., owners of the patents for magnesia covering, have commenced a suit in the United States Circuit Court for the Southern District of New York, against the Philip Carey Mfg. Co., George D. Crabb, J. E. Breeze, Schoellkopf, Hartford & Hanna Co., J. F. Schoellkopf, Jr., James Hartford, W. W. Hanna, C. P. Hugo Schoellkopf and Jesse W. Starr to restrain the defendants from making and selling magnesia covering for boilers and steam pipes containing more than 50 per cent. of magnesia, and especially coverings containing 85 per cent. of magnesia. The bill prays for a preliminary writ of injunction, to be continued during the pendency of the suit, and upon the final determination thereof to be made perpetual, and also demands an accounting and damages.

The Vanderbilt Boiler.

In the course of a lecture by Mr. Vauclain at the February meeting of the New England Railroad Club he spoke as follows of the Vanderbilt boiler:

"Just at the close of the century we have successfully introduced what is known as the Vanderbilt boiler. The abolition of stays, etc., is a great advance, but three or four years must elapse before the conservatism of our motive power departments will permit its acceptance.

This boiler was designed and introduced by Cornelius Vanderbilt, and gives great promise for the future. The rapidity with which the fire-box can be renewed and the absence of usual repairs on a locomotive commend it. The fact that the boiler has been promoted by Mr. Vanderbilt is perhaps somewhat of a handicap; as were it a Brown boiler or a Smith boiler it might receive more prompt recognition. For full information see paper read by Cornelius Vanderbilt before the Am. Soc. M. E., January, 1901."

AN EXPLOSION IN A COMPRESSED AIR CAR.

Early one morning last week there was an explosion in one of the compressed air cars operating on 28th and 29th streets, New York. The explosion appears to have caused a good deal of consternation among the newspaper reporters, but apparently it was not a serious affair. We are informed by responsible officers of the Compressed Air Company that the accident consisted in the bursting of the reheating tank, which, as it will be remembered, is charged with hot water and through which the air passes after it has been reduced to working pressure. The air feed pipe in this heater got adrift and moved backward and forward along the bottom until it wore a groove in the shell, at which point the break took place. This pipe is held in place by three $\frac{3}{8}$ -in. pipe plugs, the threads on which were corroded, allowing the pipe to move. It will be seen that heavy air pressure had nothing to do with the case.

EAST RIVER BRIDGE NO. 3.

On Thursday of last week a temporary injunction was granted restraining the Commissioner of Bridges of New York from making a contract for the tower foundations of East River Bridge No. 3, particulars of which we recently published. The plaintiff alleged irregularities in the lowest bid and in that next to the lowest, but further he urged that the proposals and bids had been made under the specifications necessitated by the labor laws of the state of New York, which have been pronounced unconstitutional. The Commissioner, on Monday, announced that the six bids had been rejected and that the work will be readvertised.

THE U. S. STEEL CORPORATION.

Messrs. J. P. Morgan & Co., syndicate managers of the United States Steel Corporation, issue a circular under date of April 2 calling for deposits of the stock of the American Bridge Company in exchange for stock of the United States Steel Corporation. They also call for the stock of the Lake Superior Consolidated Iron Mines. For each \$100 American Bridge preferred will be given \$110 United States Steel Corporation preferred. For each \$100 American Bridge common will be given \$105 United States Steel common. For each \$100 of stock of the Lake Superior Consolidated Iron Mines will be given \$135 preferred and \$135 common of the United States Steel stock. The United States Steel Corporation has increased its capital stock from \$3,000,000, the sum named at the time of incorporation, to \$1,100,000,000.

It is announced that the organization of the United States Steel Corporation will be as follows: Directors, J. Pierpont Morgan, John D. Rockefeller, Francis H. Peabody, Henry H. Rogers, Charles M. Schwab, Elbert H. Gary, Robert Bacon, Charles Steele, Marshall Field, Norman B. Ream, P. A. B. Widener, William H. Moore, James H. Reed, Henry C. Frick, Daniel G. Reid, E. C. Converse, Percival Roberts, J. D. Rockefeller, Jr., Alfred Clifford, William E. Dodge, Nathaniel Thayer, William Edenborn, Abram S. Hewitt, Clement A. Griscom.

President, Charles M. Schwab.

Treasurer, Arthur F. Luke.

Secretary, Richard Trimble.

Executive Committee, E. H. Gary, chairman; Daniel G. Reid, William Edenborn, E. C. Converse, Percival Roberts and Charles Steele.

Finance Committee, Robert Bacon, chairman; Henry H. Rogers, Norman B. Ream and P. A. B. Widener.

LOCK AND DAM, NO. 13, OHIO RIVER.

The Chief of Engineers, U. S. A., has received the specifications for lock and dam No. 13, to be built in the Ohio River at Wheeling, W. Va., and it is expected that bids will soon be wanted for the work.

THE SCRAP HEAP.

Notes.

The Boston & Albany has reduced the number of brakemen on all its through freight trains from three to two.

The Lake Shore & Michigan Southern has increased the pay of freight firemen from \$2.10 per 100 miles to \$2.20; those on heavy passenger trains, \$1.85 to \$1.95; light passenger trains \$1.85 to \$1.90.

The Police Department of the city of Yonkers, N. Y., has had telephones put into the six block signal towers along the line of the New York Central within the limits of that city, with a view to securing prompt information concerning tramps and other law-breakers coming to or going from the city.

The Brooklyn Rapid Transit Company has extended to the employees on its elevated line the same scale of wages which has been enjoyed by the men on the surface roads for the last two years. The men are divided into four groups: Those who have been employed for five years, those who have been employed at least three years, those for at least two years and those less than two years. The first class now receive

an increase of 15 per cent. in their wages, giving the motormen \$2.58, conductors, \$2.30 and guards \$1.72 a day. The second class will get an increase of 10 per cent. and the third class 5 per cent. The fourth class will be paid as follows: Motormen, \$2.25; conductors, \$2; guards, \$1.50.

Traffic Notes.

The New York Central announces that for 50 cents a piece baggage sent from the principal stations to New York city can be checked from the starting point through to hotels and residences.

The Canadian Pacific announces a reduction of 20 per cent. in passenger fares on the Pacific Division. In the most thinly settled portion of this territory the rate is now five cents; in other places, four cents. Commercial travelers will hereafter be carried at three cents a mile.

Fifteen carloads of oranges from Southern California were recently sent by water to Seattle and thence to St. Paul over the Great Northern. This unusual movement was wholly or chiefly due to the scarcity of refrigerator cars at the shipping points. Most of the fruit was transferred at San Francisco from one steamer to another.

The Legislature of the State of Washington has passed a law requiring railroads to weigh all lumber shipments within that State. The law goes into effect June 14. It is said that this law was passed in the interest of lumber shippers, who claimed that weights reported by the railroads from Minneapolis were excessive.

In 10 days following the recent rise in the Ohio River 38 barges loaded with steel rails and 10 barges carrying other steel and iron products passed Cincinnati on their way to places along the Mississippi River. Some of these rails were to go to Texas, being landed at points just below Cairo. The quantity of coal sent down from Pittsburgh on this rise of the river was about 20,000,000 bushels.

Contract for Heating and Lighting.

Proposals will soon be asked by Mr. E. M. Dawson, Chief Clerk of the Department of the Interior at Washington, for the establishment of a central power plant for heating and lighting the Patent Office building, the old Post Office Department building and the Pension building, an appropriation of \$74,000 having been made for that purpose. A new conduit and steam pipes will be required between the Pension and old Post Office Department buildings, which will cost about \$12,000.

Big Output of Rails.

Just before being taken into the United Steel Company, the Edgar Thomson mill of the Carnegie Company established a new record in the production of Bessemer steel: 1,995 gross tons of steel were produced in 133 heats. The best previous record was 1,800 tons in 120 heats. The record was made last Sunday night. The rail mill also established a new record by producing 3,195 tons of 75-lb. 30-ft. rails for the Baltimore & Ohio Railroad. Superintendents H. W. Benn and James Rinard took charge of the turns to make the records.—*New York Times*.

Apprentices for the American Bridge Company.

It is said that the American Bridge Company is about to start a system of apprenticeship. The intention is to take boys graduated from grammar schools and accept them for four years' apprenticeship after a probation of 90 days. They will be paid \$3.50 a week the first year, with an increase of \$1 a week each year thereafter. They will be bound by agreement to remain four years, and on completion of the term will get a bonus of 50 cents for each week served. Unusually good work may reduce the term, but not more than six months. Furthermore, arrangements will be made for instructions in drawing, physics, mathematics, etc., somewhat as is now done by the Westinghouse Electric & Manufacturing Company. Preference will be given to boys having had a manual training or high school education. Graduates of engineering colleges will be taken on a special basis and with wages of \$12 a week.

A Torpedo Boat Launched.

The torpedo boat Tingey, named in honor of Commodore Thomas Tingey, an officer of the early Navy, was launched from the yards of the Columbian Iron Works at Baltimore on Monday last. She is 175 ft. long with 165 tons displacement, and is to have a speed of 26 knots an hour, with twin screws and 3,000 i.h.p.

A Pennsylvania Ferryboat.

The Pennsylvania Railroad Company has added to its ferry service the new boat Chicago, which was delivered to the company March 30. The boat was built by the Burlee Dry Dock Company, of Port Richmond, Staten Island, and is finished on the lines of the standard equipment.

Rates for Private Cars.

The following figures are published (as coming from an official circular) as "Reduced Rates for Private Cars" of the Pullman Company: Sleeping cars \$45 a day, buffet sleepers \$50 and compartment cars \$50. Reductions of \$5 to \$15 a day are made if cars are chartered for 30 or 90 days. The circular announces that the company will furnish meals for private cars for the actual cost of supplies with 20 per cent. added.

Railroad Club Discussions.

In the April issue of *Locomotive Engineering* we find a statement of the reason why certain gentlemen did not take part in the discussion at the March meeting of the New York Railroad Club. We are told that "the members were deprived of the usual friendly tilt between Messrs. Forney and Sinclair, inasmuch as neither knew much about the subject." It strikes us that the reason given is quite inadequate.

LOCOMOTIVE BUILDING.

The St. Louis & San Francisco is about to order 10 locomotives.

The Mexican Central is in the market for four six-wheel switching engines.

The Parral & Durango has ordered one engine from the Baldwin Locomotive Works.

The Mexican National is having one engine built by the Baldwin Locomotive Works.

The Ulster & Delaware has ordered one engine from the Schenectady Locomotive Works.

The Central of New Jersey have ordered 19 engines from the Brooks Locomotive Works.

The Porvenir de Matchuala has ordered one engine from the Baldwin Locomotive Works.

The Buffalo, Rochester & Pittsburgh has ordered six engines from the Brooks Locomotive Works.

The Grand Trunk has ordered some consolidation engines from the Richmond Locomotive Works.

The Delaware & Hudson has ordered 12 consolidation and four switching engines from the Dickson Locomotive Works.

The International & Great Northern order with the Cooke Locomotive & Machine Works, referred to Feb. 8, calls for 26 instead of 15 engines.

The United States Government has ordered, through Major J. H. Williard of the U. S. Engineers' Office, Chicago, two engines from the Baldwin Locomotive Works. The Southern Pacific is about to order between 15 and 90 engines, of which 38 will be of the mogul type and the balance passenger, switching and consolidation engines. We understand the papers are in New York and that the contracts will be awarded from here.

The Norfolk & Western order with the Richmond Locomotive Works, referred to last week, calls for 10 Class W consolidation engines, to be exact duplicates of the 10 now being built for the road by the same works. The engines will have 21-in. x 30-in. cylinders; 56-in. driving wheels; and will weigh in working order about 170,000 lbs.

The Peoria & Pekin Union order with the Brooks Locomotive Works calls for one six-wheel switcher and one mogul. The switcher will weigh 132,000 lbs. and the mogul 138,000 lbs., with 122,000 lbs. on the drivers. They will both have 19-in. x 26-in. cylinders, the switcher 58-in. and the mogul 64-in. driving wheels, Belpaire boilers with a working steam pressure of 180 lbs. and 272 tubes 2 in. in diam. and 11 ft. 1 $\frac{1}{4}$ in. long; fire-boxes, 102 in. long and 42 in. wide, and a tender capacity for 4,000 gals. of water and six tons of coal. The specifications include Vacuum brakes, Bollmar bell ringers, Sterlingworth beam-beams, Gould couplers, Little Giant injectors, U. S. metallic valve packings, Nathan lubricators and French springs.

CAR BUILDING.

The Cincinnati, Richmond & Muncie has ordered 100 freight cars.

The Colorado Midland has ordered five chair cars from the Pullman Co.

The New York, New Haven & Hartford is building at its New Haven shops six milk cars.

The Lake Superior & Ishpeming has ordered 100 flat cars from the Pressed Steel Co.

The Ivorydale & Mill Creek Valley is having 81 freight cars built at the Milton Works of the American Car & Foundry Co.

The St. Louis Refrigerator Car Co. has ordered 75 cars from the American Car & Foundry Co. They will be built at St. Charles.

The Calvert, Waco & Brazos Valley has ordered 290 freight cars from the American Car & Foundry Co. They will be built at the Madison Works.

The Missouri Pacific has ordered six postal and six baggage cars from the American Car & Foundry Co. They will be built at the St. Charles Works.

The St. Louis & San Francisco has issued specifications for 500 box and 150 furniture cars of 60,000 lbs. capacity, 500 coal cars of 80,000 lbs. capacity and 15 cabooses.

The International & Great Northern has ordered 1,390 freight, 12 chair, six combination mail and express and three baggage cars from the American Car & Foundry Co.

The Atchison, Topeka & Santa Fe has ordered 15 chair cars from the Pullman Co., and is in the market for about 20 additional cars for passenger service and 1,500 freight cars.

The Delaware & Hudson has ordered 250 box, 200 flat bottom coal and 250 hopper bottom coal cars from the American Car & Foundry Co. They will all be of 80,000 lbs. capacity.

The Southern has ordered the following cars: 1,000 box cars from the Mt. Vernon Car Mfg. Co.; eight baggage and express, 50 ballast, 100 furniture and 500 box cars from the American Car & Foundry Co.

The Buffalo, Rochester & Pittsburgh has ordered from the American Car & Foundry Co. 500 coal cars of 80,000 lbs. capacity. These are in addition to the 500 of 70,000 lbs. capacity, referred to Feb. 15.

BRIDGE BUILDING.

ANN ARBOR, MICH.—The Detroit, Ypsilanti, Ann Arbor & Jackson Ry. will build an overhead bridge on its proposed extension between Ann Arbor and Jackson.

AKRON, OHIO.—It is stated that bids will probably be wanted in May for a concrete bridge, of Melan type, across the Ohio Canal at Falor street. It will be about 238 ft. long, of five arches, and be 42 ft. wide. The cost is estimated at \$25,000. J. W. Payne, City Engineer.

ATLANTA, IDAHO.—The Governor has signed a bill making an appropriation of \$12,000 for a highway bridge on the road between Logging Gulch, Boise County, and Atlanta, Elmore County.

BAYVILLE, N. Y.—The American Bridge Co. has the contract for a new steel bridge from the Town Board at \$10,300. (March 22, p. 207.)

BENWOOD, W. VA.—A hearing was given in Washington, March 25, on the question of a bridge over the Ohio River between Benwood and Bellaire, Ohio, proposed by the Bellaire, Benwood & Wheeling Bridge Co., with a central span of 800 ft. J. M. Grady, Braddock, Pa., is President of the company.

BRIDGEPORT, CONN.—Bids are wanted for the sub-structure and superstructure of a steel bridge over Yellow Mill Pond until April 15. The plans may be seen after April 5 at the office of G. M. Scofield, Engineer for the Commissioners, Park Row Bldg., New York city.

BRISTOL, VA.—TENN.—Bids are wanted, May 1, for the two iron bridges to be built over Beaver Creek in this city. H. E. Jones, Chairman of the Finance Committee. (March 22, p. 207.)

At a conference of the Street Committees of the two

Bristols, last week, it was decided to recommend two iron bridges on Main street.

CANTON, MISS.—The Birmingham & Vicksburg R. R., mentioned under the R. R. Construction, will need one iron bridge. D. Levy, of Canton, is Secretary.

CHALLIS, IDAHO.—Bills have been signed by the Governor for two bridges in Custer County, one over Salmon River at Barr's bridge, the other on the road between Yankee Forks and Blaine County line.

CLEVELAND, OHIO.—The City Engineer is authorized to make plans and estimates for the bridge proposed on Clark avenue connecting Jennings avenue with Petri street.

CONNEAUT, OHIO.—We are told that the estimates recorded in this column March 22 are for a bridge to cross Conneaut Creek, and that a vote will have to be taken before the work can be authorized. J. S. Sill, County Surveyor, Ashtabula.

DENVER COLO.—A resolution has been passed by the County Commissioners for two steel bridges, one to cross Clear Creek and the other Dry Creek.

FREDERICTON, N. B.—C. H. LaBilloir, Commissioner of Public Works, wants bids for a bridge over the upper Big Tracadie River in Gloucester County.

HAMMONTON, N. J.—The Atlantic City R. R. (P. & R.) proposes to build over Eleventh street.

HARRISBURG, PA.—Both branches of City Council have voted to accept the agreement and plans for the Market street subway submitted to them by the City Engineer, the Pennsylvania and the Philadelphia & Reading railroads. A contract will be let in the near future for this improvement which was described in the *Railroad Gazette* of Jan. 18, page 48, and which will cost about \$75,000. The city will build the approaches and the railroad companies that part of the subway under their respective roadbeds.

IDAHO CITY, IDAHO.—The Governor has signed a bill making an appropriation for a bridge across Payette River in Boise County.

KINGSTON, N. Y.—A bill is before the State Legislature to appropriate \$10,000 for a steel bridge over Roundout Creek at Napanoc near the Eastern New York Reformatory.

LYNCHBURG, VA.—The County Court has been petitioned for a steel or stone bridge to replace the present one over East Mulberry Creek in the eastern part of the town.

MANCHESTER, VA.—The City Council is considering a proposition submitted by the Atlantic Coast Line to rebuild the bridge which connects Belle Isle with Manchester.

MARSHALLTOWN, IOWA.—It is stated that the Iowa Central has plans for a general overhauling of the bridges on both the North and South Divisions.

MIAMI, IND. T.—W. E. Rowsey, of Miami, informs us that he will receive bids on April 9 for an iron and steel bridge 300 ft. long, over Neosho River, to be used as a toll bridge.

MICHIGAN CITY, IND.—The American Bridge Co. has the contract at \$14,370 for the drawbridge across the harbor at Second street.

MITTINEAGUE, MASS.—Collins & Norton, Engineers of Springfield, Mass., inform us that the West Springfield-Agawam bridge proposed over Westfield River at this place, will be a steel deck bridge of two 150-ft. spans, with a 20-ft. roadway and two 5-ft. sidewalks. Bids will soon be wanted.

MODESTO, CAL.—The Commissioners of Stanislaus County and Merced County have agreed to build a bridge across the San Joaquin River near Hills Ferry. It is expected that bids will be authorized at the April meeting.

NEW YORK, N. Y.—The Board of Estimate and Apportionment has appropriated \$550,000 to begin work on the Blackwell's Island bridge, which was described in the *Railroad Gazette* March 29, p. 219.

The Board of Estimate and Apportionment has appropriated \$30,000 for the 135th street bridge over Mott Haven Canal.

A bill has been introduced in the Legislature by Senator Raines which defines the system of elevated railroads to be built along the Hudson River front on Manhattan Island as an approach to the proposed bridge over the Hudson River by the New York & New Jersey Bridge Co.

OAKLAND, CAL.—The County Supervisors received the following bids for a concrete culvert over San Leandro Creek: San Francisco Bridge Co., \$32,500; A. W. Burrill, \$31,640; Ransome Concrete Co., \$29,900; E. B. Stone, \$25,840 (accepted); F. W. Bilger, \$26,833; Cotton Bros., \$27,530.

PATERSON, N. J.—The Delaware, Lackawanna & Western has let a contract to the Passaic Rolling Mills Co. for a new bridge over the Passaic River at Little Falls Turnpike, requiring about 1,500 tons of steel.

PHILADELPHIA, PA.—A contract is reported let to Ryan & Kelly, of Philadelphia, for a steel bridge over the Pennsylvania R. R. tracks at Commercial avenue and Jackson street, which is estimated to cost \$100,000.

The Director of Public Works has let contracts for a number of bridges in different parts of the city to Henderson & Co., 1215 Filbert street, Philadelphia, as follows:

Thirty-third street bridge over the Philadelphia & Reading and the Pennsylvania tracks, \$128,000.

Allegheny avenue bridge, 130 ft. long, under the four tracks of the North Pennsylvania (P. & R.) R. R., \$62,000.

Lehigh Avenue bridge under Connecting Ry. of Philadelphia & Reading, to be 144 ft. long and carry six tracks, at \$76,000.

Frankford Avenue and Old Front street bridges, 85 ft. and 95 ft., over Frankford Creek, including a change in the course of the creek, \$98,000.

Seventy-first street bridge over Philadelphia, Wilmington & Baltimore tracks, a temporary structure, \$15,500.

At Olney Avenue bridges under Tabor branch of the Philadelphia & Reading and under the North Pennsylvania R. R., \$44,000.

Fifty-seventh street bridge over the West Chester & Philadelphia R. R., 60 ft. steel structure, \$27,950.

The bids were opened March 21. Estimates on four additional bridges will be taken in a short time.

PITTSBURGH, PA.—The Pittsburgh, Cincinnati, Chicago & St. Louis will, it is said, soon build its new bridge over the Monongahela River from Try street.

RAT PORTAGE, ONT.—Thomas R. Deacon, C. E., of this place, informs us that the bridge proposed over Winnipeg River on the public road is to be a steel camel-back Pratt truss structure of a total length of 480 ft. The estimated cost is \$18,000 for bridge and piers complete.

REXFORD FLATS, N. Y.—A bill has been introduced in the United States Senate for an appropriation of \$10,000 for a steel bridge over the Erie Canal just west of the Upper Mohawk aqueduct near Rexford Flats, to be built under the direction of the State Superintendent of Public Works.

ROCHESTER, N. Y.—A bridge will soon be built by the

New York Central & Hudson River R. R. over Joseph avenue to replace the present structure.

ST. ANTHONY, IDAHO.—The Governor has signed bills making appropriations for two bridges across Snake River in Fremont County, one to be located at the Big Buttes.

SAN MATEO, CAL.—It is proposed to issue bonds for building steel and concrete bridges in the county.

SAULT STE. MARIE, ONT.—A bill has been introduced into the Canadian Parliament to incorporate the St. Marys Bridge Co., to build a bridge to connect the Ontario and Michigan "Soo" by a street railroad and passenger bridge. Wm. Morris and W. G. Francis, of Toronto, are the promoters.

SHEBOYGAN, WIS.—We are told that the bridge proposed over Sheboygan River which will be about 300 ft. long and cost \$30,000, to replace the present bridge, will not be built this year.

SHOSHONE, IDAHO.—The Governor has signed a bill making an appropriation for a bridge across Snake River in Lincoln and Cassia counties at a place called The Narrows.

SPRINGFIELD, MO.—We are told that the city contemplates building a bridge over the St. Louis & San Francisco tracks in the near future and plans will be made after about \$35,000 of bonds have been sold on April 9. G. W. Hackney, City Clerk.

SYRACUSE, N. Y.—A bridge is proposed over Onondaga Creek at West Brighton avenue.

TERRE HAUTE, IND.—The Terre Haute & Indianapolis, it is said, has submitted plans to the Vigo County Commissioners for a 180-ft. trestle over the tracks at Liggett street. James Soules, County Auditor.

TIVERTON, R. I.—The Governor has sent a message to the Legislature recommending the appointment of a commission to consider a new iron drawbridge with two openings of 60 ft. each, at Tiverton. The sum of \$100,000 is appropriated for the work.

TOPEKA, KAN.—We are told that contracts will be let on the 15th or 20th of April for four steel bridges to be built over Kansas River near Topeka, each to cost about \$20,000. J. P. Rogers, County Surveyor. The County Clerk will receive the bids.

The Atchison, Topeka & Santa Fe is making plans for a 6-ft. footwalk to be added to its railroad bridge over the Kansas River.

TORONTO JUNCTION, ONT.—The City Council has ordered that bids be received for an overhead bridge crossing the tracks of the Canadian Pacific near the foot of McMurray avenue.

TOWANDA, PA.—It is said that the County Commissioners have ordered estimates for the Sugar Creek bridge for which bids will soon be wanted.

WEST ALBANY, N. Y.—The New York Central & Hudson River Railroad is making plans for an eight-span bridge to carry Watervliet avenue over the tracks at West Albany. The bridge will be a plate girder on steel bents with a wooden floor. The length will be: Two spans of 96 ft. 10 in., one span 95 ft. 4 in., four spans 96 ft., and one span of 78 ft. 3 in. Plans and specifications will be sent out for bids in a few weeks.

WHEELING, W. VA.—The Baltimore & Ohio will rebuild the remaining light bridges on the Cleveland, Lorain & Wheeling. It is said the bridge over the Ohio River at Wheeling will also be rebuilt.

WOOLWICH, ME.—The Maine Central will build a bridge with three 80-ft. plate girders, in connection with the relocation of the tracks in Woolwich.

WYTHEVILLE, VA.—The Norfolk & Western will replace its bridge over Reed Creek with a solid masonry structure.

Other Structures.

DURAND, MICH.—The Ann Arbor R. R. proposes to build a joint passenger station and office building with the Grand Trunk at Durand. Nothing definite is decided.

EAST ST. LOUIS, ILL.—The Mobile & Ohio proposes to build a new freight depot at East St. Louis. A passenger station is proposed at Tupelo, Mo. Nothing definite is decided.

The Baltimore & Ohio Southwestern freight house and platform and 50 cars loaded with grain at East St. Louis, Ill., were burned on the night of April 1. The damage is estimated at \$150,000, covered by insurance.

ELWOOD, IND.—The Lake Erie & Western proposes to build a \$20,000 depot in Elwood.

EVANSVILLE, IND.—The Louisville & Nashville is reported to have submitted plans to the city for a new depot in Evansville which will cost about \$300,000.

EVERETT, WASH.—The Great Northern is reported to have let a contract for a 500-ft. depot in Everett.

GAINESVILLE, TEXAS.—The Atchison, Topeka & Santa Fe will build a \$12,000 brick and stone passenger station at this place.

GREENVILLE, TEXAS.—Fire on March 21 destroyed the Sherman, Shreveport & Southern shops and roundhouse.

GUTHRIE, OKLA. T.—The Atchison, Topeka & Santa Fe is considering building a union passenger station at Guthrie, but nothing definite is decided.

JONESBORO, ARK.—The Kansas City, Fort Scott & Memphis is making arrangements to build a joint station with the St. Louis Southwestern at this place.

KANSAS CITY, KAN.—The Atchison, Topeka & Santa Fe is considering building a new freight depot at Kansas City.

KANSAS CITY, MO.—The Chicago Great Western has let a contract to Geo. W. Goodlander for a temporary frame depot at the foot of Mulberry street, to be 48 x 500 ft., and cost \$15,000.

MATTOON, ILL.—The Illinois Central is reported getting out plans for a joint station with the "Big Four" at Mattoon.

MILWAUKEE, WIS.—The Edward P. Allis Co. informs us that they have let a contract for a machine shop 120 ft. wide x 575 ft. long, with its portion of the machine erecting shop 115 ft. x 190 ft. Negotiations are now in progress which the company expects will result in building five machine shops, with erecting shops to match; also a foundry 220 ft. wide and about 900 ft. long; also a pattern shop 100 ft. wide and 900 ft. long. This matter will probably be determined this week. The new shops are to be known as the West Shops and are designed by Edwin Reynolds, Second Vice-President and Superintendent.

MORGAN, TEXAS.—We are told that the Gulf, Colorado & Santa Fe is getting out plans for a combination freight and passenger depot at Morgan.

PHILADELPHIA, PA.—The Atlantic & Gulf Construction Co., contractors for building the Government dry dock, has notified the Secretary of the Navy that it will accept the decision of the Board of Engineers that fixed the extra pay and extended the time for building a dry

dock of concrete and granite instead of timber at the League Island Yard. (March 29, p. 228.)

PITTSBURGH, PA.—The Pittsburgh, Virginia & Charleston (Pennsylvania) has a permit from the city to build a two-story brick passenger station to cost \$13,600, at South Thirteenth and Sarah streets.

PORTLAND, ORE.—The Northern Pacific Terminal Co. tells us that late in the year they expect to have plans and estimates ready for the large passenger car sheds which are expected to be built in the spring of 1902.

PRESCOTT, ONT.—The Canadian Pacific Ry. has plans to enlarge the station buildings at Prescott and Brockville, Ont., in connection with the enlargement of the yard. We are told that nothing will be done at present.

RATON, N. MEX.—The Atchison, Topeka & Santa Fe is considering a passenger and freight station for Raton.

READING, PA.—The Philadelphia & Reading has let a contract to L. H. Focht, contractor of Reading, for additional buildings to complete its locomotive plant at Reading. The present contract includes a new smith and forge shop, store house and boiler shop, to cost about \$175,000.

SALEM, N. H.—A large power station, it is expected, will be built at Salem in connection with the plan to consolidate a number of electric railroads in this vicinity into the Hudson, Pelham & Salem Electric Ry. Co., a New Hampshire corporation.

SAN FRANCISCO, CAL.—It is announced that the Southern Pacific will rebuild 20 passenger stations on its lines in Southern California.

SPRINGFIELD, ILL.—Plans are being made by C. Frank Jobson, of Chicago, for a freight warehouse for the Chicago & Alton at Springfield at a cost of \$25,000.

STAMFORD, CONN.—It is said that plans have been made by the Yale & Towne Manufacturing Co. for new buildings for the Branford Branch, and that bids will soon be wanted.

WACO, TEXAS.—The Missouri, Kansas & Texas Ry. of Texas has let a contract to J. A. Daly for a new passenger station at Waco to cost about \$35,000. It will be 196 ft. 5 in. long, 42 ft. wide and 33 ft. high. Work was begun March 1.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xii.)

Western Society of Engineers.

At a meeting of the Western Society of Engineers, Wednesday evening, April 3, Mr. G. E. Thomas read a paper descriptive of the pneumatic caisson foundations of the Schubenacadie Bridge in Nova Scotia. The paper was illustrated with lantern slides.

The Air-Brake Association.

The eight annual convention of the Air-Brake Association will be held in Chicago, Ill., beginning April 30, and continue for three days or more. Convention headquarters will be at the Leland Hotel. Special rates have been secured. Arrangements have been made with the Pullman Company, whereby special half rates will be granted to members and their immediate families.

The American Railway Association.

The spring meeting of this Association will be held at the Waldorf-Astoria, Fifth avenue and Thirty-third street, New York City, on April 24. Reports will be presented by the Executive Committee and the Committees on Train Rules, on Car Service, on Safety Appliances and on Standard Dimensions of Box Cars. The annual election of officers will take place at this meeting.

American Society of Civil Engineers.

The March issue of the *Proceedings* contains discussions on various papers that have been presented, namely, precise spirit leveling, adjustment of transit and compass surveys, gravity sand filters and filtration of water. It contains also eight memoirs of members who have died in recent years.

The attention of members is called to the fact that no formal papers are to be presented at the Annual Convention, which will be held June 25 to 28 at Niagara Falls. Instead of papers, discussion is asked for on papers that have been published during the six months immediately preceding the convention. The Publication Committee asks suggestions from members of topics for discussion, but no such suggestions had been received at the time of printing this issue of the *Proceedings*.

The Engineers' Club of Philadelphia.

A business meeting will be held on Saturday, April 6, at 8 o'clock p. m. The papers will be "A New Type of Water-Tube Boiler," illustrated, by Henry G. Morris, and "Submarine Electric Cables," illustrated, by A. E. Kennelly. Should Dr. Kennelly be unable to be present, Mr. Carl Hering will present some lantern slides and notes on "Three-Phase Electric Traction in Europe."

At the meeting of March 16 Mr. John C. Trautwine, Jr., presented the last of a series of papers on the Queen Lane Division of the Water Works of Philadelphia, which were prepared for the club by present or former officials of the City's Bureau of Water.

This reservoir, which was begun in October, 1892, and practically completed in two years, was found to leak when the water admitted to it reached a depth of 10 ft. It was afterwards improved by building a concrete footings wall to a firm foundation under the outer slopes entirely surrounding the basin, and by covering the inner slopes with two layers of melted asphalt, having between them a sheet of burlap anchored at the top, and by adding to the floor of the reservoir 2 in. of asphalt concrete with a top coating of melted asphalt.

The characteristics of the site of the reservoir, its original and modified design, the material used in its construction and the method of making the subsequent repairs were fully described and illustrated by a large series of views projected by the electric lantern.

Central Railway Club.

At the March meeting it was decided to meet monthly except during June, and to hold all future meetings at 2 o'clock in the afternoon. Therefore the next regular meeting of the Club will be held at the Hotel Iroquois, Buffalo, N. Y., at 2 p. m., on Friday, April 12, 1901. The Executive Committee will meet at 12 o'clock noon.

As there was insufficient time at the March meeting in which to consider the report of the Committee on Comparative Engine House Facilities, etc., it will be the first subject for discussion.

The Committee on Revision of the Rules of Interchange was continued by a vote at the March meeting with instructions to report to the April session on "Repairs to Pressed Steel Car Bodies and Trucks." The committee consists of J. R. Petrie, Chairman; R. S. Miller and

Robert Gunn. The report of the Committee was not received in time to be issued with this circular, but will be printed and distributed at the meeting.

Pursuant to the adoption of recommendations made by a special committee the Question Box department has now been organized as a permanent feature of Club work. The Committee on Question Box consists of Mr. H. A. Ferguson, A. E. M. P., Pennsylvania R. R., Williamsport, Pa.; H. F. Ball, M. E. L. S. & M. S. R. R., Cleveland, Ohio, and H. C. McCarty, Williamsport, Pa. The Committee will classify the questions in the order of their importance, rejecting any that may be improper for the Club to consider, and selecting one or more that may be most suitable to become the subject of a paper to be presented by whomever the President may select. Of the remainder the Committee will select a number that will be printed and distributed in advance of a meeting. These may be discussed and form part of the printed proceedings.

Engineers' Club of St. Louis.

The 523d meeting was held March 20, at 8:20 p. m., President Spencer presiding. Twenty-four members and four visitors were present. Prof. Van Ornum was requested to take the chair and President Spencer addressed the Club in behalf of the Public Welfare Commission, explaining in detail the objects and needs of the Commission, its relation to the Engineers' Club, and the work it had so far accomplished. Mr. Flad moved that the Executive Committee be directed to pay the \$100 assessed against the Engineers' Club out of the Entertainment Fund. Carried.

The subject of the evening was an informal address by Mr. S. Bent Russell on "Revetment of River Bank at the Chain of Rocks by the St. Louis Water Department." Maps and general plans were exhibited showing the conditions and scheme of construction. Lantern slides were also exhibited showing the progress of the work at different times, the plant used in the work, etc. The work is estimated to cost when complete about \$80,000, and has extended over a period of about four years. The bank protected is about 6,000 ft. long and from 25 to 30 ft. in vertical height. The points of greatest interest are, the use of gravel concrete in the place of the usual rip-rap on the upper bank, and the method used to prevent the revetment being undermined at the toe of the slope where the work rested on soft material. These methods include rip-rap dikes, brush mattresses and aprons made of sawed lumber bound together with wire cable and sunk with rip-rap. Another point of interest is the treatment of the bank where it showed a disposition to slide or slough off. Discussion followed by Messrs. Maltby and Turner. For the next meeting announcement was made of a paper by Mr. Louis Bendit on "Treatment of Feed Water for Boilers."

PERSONAL.

(For other personal mention see Elections and Appointments.)

—Mr. F. E. Boothby, General Passenger Agent of the Maine Central, has been elected Mayor of the city of Portland, Me.

—Mr. James I. Blakeslee, at one time President of the Montrose Railway, died March 31, aged 86 years. For fourteen years (1866-1880) Mr. Blakeslee was Superintendent of the Lehigh & Mahanoy, known as the Mahanoy Division of the Lehigh Valley Railroad.

—Mr. Charles Momm, a First Assistant Examiner in the Patent Office at Washington, in the division having charge of railroad brakes, appliances and rolling stock, committed suicide in Washington last week. Mr. Momm was born in Prussia 32 years ago, and had been in the Patent Office only one year.

—Mr. D. W. Richards, Jr., for several years in the employ of the Union Switch & Signal Company, has been appointed Signal Engineer of the Norfolk & Western, with headquarters at Roanoke, Va. Mr. Richards is a graduate of the Massachusetts Institute of Technology.

—Mr. Benjamin F. Newcomer, Chairman of the Finance Committee of the Northern Central, died of apoplexy March 30. He was born in Washington County, Md., April 28, 1827. Mr. Newcomer was President of the Baltimore & Potomac (Philadelphia, Wilmington & Baltimore), also a Director of the Atlantic Coast Line and of several other railroads and allied companies, and for two years was one of the Finance Commissioners of the Baltimore municipal government.

—Mr. William J. Singleton, Superintendent of the Montreal Terminals and of the Ottawa Division of the Canadian Pacific, was born at Lancashire, England. Mr. Singleton was for a time brakeman and conductor on the Grand Trunk and in 1871 became Assistant Agent and Yardmaster. In 1882 he became Agent of the Canadian Pacific at Ottawa, later becoming Agent at Hochelaga and Trainmaster at North Bay. In January, 1886, he was appointed Assistant Superintendent of the Chapleau Division and in 1892 Assistant Superintendent of the Montreal Terminals.

—Mr. J. M. Herbert, the new General Superintendent of the St. Louis, Iron Mountain & Southern (Missouri Pacific), was born at Westmoreland County, Pa., in 1863. He entered the service of the Wabash, St. Louis & Pacific, in 1880, as a night telegraph operator, and remained with this company until 1897, with the exception of a few months, as telegraph operator, station agent, yard clerk, Train Despatcher, Chief Train Despatcher and Trainmaster. In June, 1897, he was appointed Trainmaster of the Grand Trunk at Island Pond, Vt., and in 1898 he became Superintendent of the Eastern Division, which position Mr. Herbert resigned to accept a similar one with the Missouri Pacific.

—Mr. Ulrich Eberhardt died at his home in Newark, N. J., last Sunday night in his 60th year. He was one of the most prominent manufacturers of Newark, and the old firm of Gould & Eberhardt is of international renown as builders of high class machine tools. A short time ago the business was incorporated, but the firm name was retained. Mr. Eberhardt was the President, and continued to hold the controlling interest. His death will not affect the business of the firm. The firm was the first to enter the machine tool business on an extensive scale in Newark, and Mr. Eberhardt's success came from ability, untiring effort and unceasing ambition. He was in the shop until the day when he was compelled to take to the bed from which he never again arose. He took an unusual interest in the men in his employ. His only brother, Henry E. Eberhardt, who still survives him, was associated with him in building the business, as was also Ezra Gould, who is also living but no longer identified with the company. Many of Mr. Eberhardt's early associates are now foremen in the shop, having been connected with the works for 20 to 25 years. Mr. Eberhardt controlled his men admirably, and never had a strike or trouble with his employees. He was public spirited, and took considerable interest in local and State

affairs, but was of a retiring disposition, and only his close associates heard of his unostentatious public works. He was a good friend to the Newark Technical School, and in fact all institutions for mechanical learning. His charities were numerous, but always unknown to the public.

On Dec. 4, 1841, he was born in the village of Mettlen, Canton of Turgau, Switzerland. His father was humble but of the noble ancestry of Count Ulrich Eberhardt. In the early fifties his father came to this country with his family directly to Newark. Ulrich was sent to work as an apprentice at the works of Ezra Gould, and received his education at the evening schools. He made rapid progress, and shortly after he had reached his majority was taken into the firm, and in 1890 he acquired complete control of the business.

ELECTIONS AND APPOINTMENTS.

California Eastern.—R. S. Seibert, General Manager, will also assume the duties of Vice-President and Secretary. I. B. Newton has been elected Treasurer.

Central of Georgia.—J. L. Whitsitt, heretofore Master Mechanic at Columbus, Ga., has been made General Engine and Car Inspector.

Central Ontario.—J. D. Rowe has been appointed Treasurer, succeeding R. H. Spencer, who has assumed other duties.

Chicago & Northwestern.—The headquarters of C. A. Lichy, Superintendent of Bridges and Buildings, have been removed from Clinton, Iowa, to Boone, Iowa, effective March 15.

Chicago Great Western.—J. P. Elmer has been appointed General Passenger Agent, with headquarters at 115 Adams street, Chicago, succeeding F. H. Lord, resigned to accept service with another company. Effective April 1. The reports that T. N. Hooper, Assistant General Freight Agent, had resigned to become General Manager of the Iowa Northern, are premature. Mr. Hooper has not resigned.

Chicago, Rock Island & Pacific.—L. M. Allen, heretofore Assistant General Passenger Agent, has been appointed First Assistant General Passenger Agent.

Chicago Terminal Transfer.—Angus Brown has been appointed Master Mechanic, succeeding J. Hill, resigned.

Cincinnati Connecting Belt.—T. D. Rhodes has been elected Secretary and Treasurer. L. E. Johnson succeeds Mr. Rhodes as General Manager.

Cleveland, Cincinnati, Chicago & St. Louis.—L. S. Rose, heretofore Engineer Maintenance of Way at Mt. Carmel, Ill., has been transferred to Mattoon, Ill., as Engineer Maintenance of Way, succeeding J. W. Copher, resigned.

Colorado Springs & Cripple Creek District.—E. R. Walker has been appointed Superintendent of the Cripple Creek District Terminals, with headquarters at Cripple Creek, Colo.

Des Moines, Iowa City & Eastern.—The officers of this company, referred to in the Construction column, are: President, Geo. W. Ball, Iowa City; First Vice-President, A. F. Rayburn, Montezuma; Second Vice-President, Milo Ward, Des Moines; Secretary, C. A. Starr, Des Moines; Treasurer and General Manager, D. B. Lyons, Des Moines.

Detroit & River St. Clair.—The title of W. O. Wood has been changed from Superintendent to General Superintendent.

Erie.—It is generally understood that F. D. Underwood, Second Vice-President and General Manager of the Baltimore & Ohio, is to take the Presidency of the Erie and that E. B. Thomas, President of the Erie, is to become Chairman of the Board.

Gulf & Ship Island.—R. E. Powers has been appointed Treasurer, succeeding W. W. Bell. Thomas P. Hale, heretofore General Freight and Passenger Agent, has become Second Vice-President, succeeding S. S. Bullis. Mr. Hale will also act as General Manager. (See R. R. News column.)

Illinois Central.—R. F. Reynolds has been appointed Assistant General Freight Agent, with headquarters at New Orleans, La.

Jackson, Columbus & Northeastern.—This company has been reorganized with the following officers: President, I. C. Enoch; Vice-President, T. W. Brane; Treasurer, W. M. Anderson, and Secretary, E. S. Wilson. The Directors, including those above mentioned, except Mr. Brane, are: Charles B. Galloway, Edgar S. Wilson, J. J. Coman, J. L. Power, A. M. Byrd, L. M. Garrett, Dr. J. E. Noble, W. O. Hight and J. T. Armstrong. (See Railroad Construction, March 8, 1901.)

McKeesport Connecting.—J. D. Culbertson has been elected Vice-President, with headquarters at Wheeling, W. Va. E. L. Wiles becomes General Manager, with headquarters at Benwood, W. Va., succeeding W. B. Schiller.

Mexican National.—At a meeting, held March 22, M. Erdmann, H. W. Taft and G. Morton were elected Directors, succeeding G. F. Peabody, W. Hinchman and J. Sullivan.

Missouri Pacific.—A. DeBernardi has been appointed Superintendent, with headquarters at Osawatomie, Kan., succeeding J. M. Herbert. Mr. DeBernardi is succeeded as Division Superintendent at Concordia, Kan., by J. F. Sims.

Norfolk & Western.—D. W. Richards, Jr., heretofore with the Union Switch & Signal Company, has been appointed Signal Engineer of the N. & W., with headquarters at Roanoke, Va.

Panama.—At a meeting, held April 1, Maurice Hutin was elected a Director, succeeding G. Whaley.

Philadelphia & Reading.—According to Philadelphia press reports, George F. Baer is to succeed J. S. Harris as President.

Pittsburgh, Chartiers & Youghiogheny.—The headquarters of J. B. Safford, Superintendent, have been removed from McKees Rocks, Pa., to Pittsburgh, Pa.

South St. Paul Belt.—The officers of this company are: C. J. Ives, President; Robert Williams, Vice-President and General Manager; S. S. Dorwart, Treasurer, and H. F. White, Engineer. (Officers of the Burlington, Cedar Rapids & Northern.)

Tennessee Coal, Iron & R. R.—At a meeting of the Directors, to be held this month, L. T. Beecher will be elected Treasurer. J. S. Colyar has been appointed Superintendent, with headquarters at Sheffield, Ala., succeeding J. J. Gray.

Toledo, St. Louis & Western.—S. B. Zartman has been appointed Superintendent, with headquarters at Charleston, Ill., succeeding K. A. Gohring, who, in turn, has been transferred to Frankfort, Ind., as Superintendent, succeeding A. H. Jones.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ARLINGTON, WALTHAM & CONCORD.—Application has been made to the Massachusetts Legislature to incorporate this company to build an electric line through the towns named. Henry C. Long and ex-Senator Henry S. Milton are among the incorporators.

ATCHISON, TOPEKA & SANTA FE.—The California Legislature has passed a bill authorizing this company to build freight terminals at China Basin, San Francisco. The building of a sea wall 100 ft. wide and about 1,000 ft. long and the filling in of the Basin is estimated to cost \$1,200,000. Under the provisions of the bill plans must be approved by the Harbor Commissioners, work begun not later than June, and \$50,000 expended the first year. (Construction Supplement, March 8, 1901.)

ATKINSON & NIobrara.—This company, whose project has already been noted in these columns, was incorporated in Nebraska March 27, with a capital stock of \$300,000. The proposed line is from Atkinson north about 35 miles to Perry. The promoters are: A. O. Perry, Atkinson, W. M. Wright, George W. Poynter, B. J. Scannell and T. A. Harris. (Construction Supplement, March 8, 1901.)

BIRMINGHAM & VICKSBURG.—Surveys are completed for 40 miles from Vicksburg, Miss., east to Canton, and are now in progress from Canton toward Birmingham, Ala. The maximum grades will be 1 per cent., and the maximum curves 3½ deg. There will be only one iron bridge. (Construction Supplement, March 8, 1901.) A. Krauss, of Chicago, is President, and D. Levy, of Canton, Miss., Secretary. (Official.)

CHICAGO, BURLINGTON & QUINCY.—An officer writes that there is nothing at present in the report that the company will build two cut-offs on the Keokuk & Western division between Des Moines, Iowa, and Leon. (March 22, p. 209.)

CHOCATOW, OKLAHOMA & GULF.—P. McCadden, of Memphis, Tenn., is reported to have the contract for building yards at Hartshorn, Ind. T.

CHELAN TRANSPORTATION & SMELTING.—R. D. Johnson, of Spokane, Wash., General Manager, is reported as announcing that sufficient stock has been sold to justify the beginning of building this line at once. It is projected from the mouth of Railroad Creek, Lake Chelan, Wash., to run to the company's property at Holden mines. The company will also operate river boats on the Columbia. (Construction Supplement, March 8, 1901.)

CHICAGO GREAT WESTERN.—President A. B. Stickney is reported as saying that financial arrangements have been completed for building extensions of the recently acquired Mason City & Fort Dodge into Omaha and Sioux City, involving about 275 miles of new road.

Surveys are being made, according to report, for extending the Lyle branch from its southern terminus at Manly, Iowa, south about 11 miles to Mason City, northern terminus of the Mason City & Fort Dodge.

The Hampton branch, according to report, will also be extended from Hampton, Iowa, west about 27 miles to Belmond or Clarion on the M. C. & F. D.

CLEVELAND, ELYRIA & WESTERN.—Building is reported to begin on an extension of this electric line from Oberlin, Ohio, west 22 miles through Birmingham, Florence and Berlin Heights to Norwalk, where connection will be made with the Toledo, Fremont & Norwalk, which is reported completed as far as Monroeville, which is about five miles from Norwalk.

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.—Extensive improvements are contemplated in Indiana, including 15 miles of double track, which is to be added to the seven miles completed between Indianapolis and Galion last year. A number of new sidings and additional tracks in yards will also be built.

COAST-KOOTENAY.—Wm. E. Oliver, of Victoria, B. C., has made application to the Legislature of British Columbia to build this line from a point on Burrard Inlet, at or near the City of Vancouver; thence via the City of New Westminster east along the south side of the valley of the Fraser River, passing near the Town of Yale; thence east along the valley of the Chilliwack, Coquihalla, Tulameen and Similkameen Rivers, or some of them, or the tributaries thereof or some of them, to a point between Penticton and the International Boundary, on the Watercourse connecting Okanagan and Osoyoos Lakes; thence via Rock Creek and Midway to Grand Forks.

CRAWFORD BAY.—Robert Irving (Railway Manager), A. Whealler (Barrister-at-law), and W. N. Brayton (Agent), all of Kaslo, B. C., have petitioned the Legislative Assembly of British Columbia for power to build a railroad from a point on or near Crawford Bay, on Kootenay Lake, in the District of West Kootenay, through the valley of Crawford Creek and the valley of the St. Mary's River, to a point at or near Fort Steele, in the District of East Kootenay, in the Province of British Columbia; and to build and operate tramways, branch lines and all necessary bridges, roads, ways, ferries, wharves and docks in connection therewith.

DES MOINES, IOWA CITY & EASTERN.—This company, whose incorporation was noted last week (p. 230), is organized to do the preliminary work, such as making surveys, connecting tracks for right of way, etc., but it does not propose to build the line, which is to run from Des Moines, Iowa, through Montezuma, Williamsburg, Iowa City and east to a connection with a trunk line. The officers are given under Election and Appointments. (Official.)

DETROIT & TOLEDO SHORE LINE.—See Railroad News column.

DES MOINES CITY.—This company is making arrangements for extending its interurban lines over 100 miles in the vicinity of Des Moines, Iowa. It has recently bought machinery to add to the power plant which will be installed this year. It is proposed to build lines from Des Moines to Nevada, to Indianola, to Newton and to Perry. Jefferson Polk, of Des Moines, is President.

ELLENVILLE & KINGSTON.—This company was incorporated in New York, March 29, with a capital stock of \$300,000, to build a standard gage railroad to be operated by steam or electrical power, running from the Elivenville branch of the New York, Ontario & Western near Elivenville, northeast 28 miles to Kingston. Thomas P. Fowler and other officers and directors of the N. Y. O. & W. are incorporators.

FORT WAYNE & DETROIT.—This company has been organized by stockholders of the Wabash to build the proposed line from Fort Wayne, Ind., northeast 28 miles to Butler.

GENESEE & ORLEANS.—This company was incorporated in New York, March 29, with a capital stock of \$350,000, to build an electric railroad 27 miles long from Batavia to Point Breeze, on the south shore of Lake Ontario, on the east side of Oak Orchard Harbor. The principal office is Albion. The incorporators are: George W. Aldridge, John H. Gregory, Houston Barnard, George

Wilder, Frederick P. Allen, Charles H. Babcock and John F. Kinney, of Rochester; Charles E. Hart, of Albion, and James M. Aikenhead, of Barre, Orleans county.

GREAT NORTHERN.—Surveys are reported in progress for the proposed extension up the Kettle River in Washington. The reported route is from Meyers Falls to run north along the Kettle River into British Columbia and west back into Washington near Nelson, and thence south through Curlew Valley to Republic, in all about 200 miles. It is stated that arrangements are being made to buy the rights of the Warner Miller Syndicate in the Curlew Valley within the Indian reservation. This extension has been under consideration for some time, but the exact route has been variously stated. (Construction Supplement, March 8, 1901.)

Surveys are reported completed for the new line between Everett, Wash., and Seattle, about 35 miles. (Construction Supplement, March 8, 1901.)

ILLINOIS CENTRAL.—C. D. Smith & Co., of Birmingham, Ala., who has recently taken the contract for 30 miles of the Yazoo & Mississippi Valley line from Tutwiler, Miss., north 65 miles to Lake Cormorant, 21 miles south of Memphis, Tenn., have taken contracts for an additional 25 miles. (Construction Supplement, March 8, 1901.)

It is said that contracts will be let for double-tracking the road on 23 miles south of Jackson, Miss.

JACKSONVILLE, ST. MARYS & JESUP.—A charter was issued in Georgia, April 1, for building this proposed line from Jesup south 100 miles to Jacksonville, Fla. The incorporators are: W. H. Whaley, Burwell Atkinson, Sam C. Atkinson, W. T. Williams and W. A. Hawkins, of Georgia; L. P. Joyce and J. C. Bachelle, of North Carolina; J. E. Starke, Roland Woodward and Dr. G. Bauer, of Florida. (March 29, p. 230.)

LANCASTER & MOUNT JOY.—This company has been organized at Lancaster, Pa., to build a railroad 13 miles long from Lancaster to Florin. Wm. B. Given, President of the Conestoga Traction Co., was elected President, and O. M. Hoffman, Columbia, Secretary and Treasurer.

LAKESIDE, NAPOLEON & WESTERN.—Surveys are reported in progress for this electric line from Napoleon, Ohio, east about 50 miles via Bowling Green, Fremont, Port Clinton and Lakeside to Marblehead. Among those interested are G. W. Brown, Fort Wayne, Ind.; D. F. Muir, of Valparaiso, Ind. (March 15, p. 194.)

MISCELLANEOUS COMPANIES.—The Southwestern Investment Co. was incorporated in New Jersey, March 28, with a capital of \$2,000,000, to operate railroads and mines and do general construction business. The incorporators are: Charles W. Parsons, of New York; William W. Carman, of Summit, N. J.; Ernest G. Ingalls, of Hastings-on-the-Hudson; William J. Hunt, of Montclair, N. J., and Frank Wilson, of Ridgewood, N. J.

NEVADA-CALIFORNIA-OREGON.—This company proposes to begin active operations in a few days for its extension from Terre, Cal., north about 110 miles to Lakeview, Ore. (Construction Supplement, March 8, 1901.)

NEW BRUNSWICK CENTRAL COAL, IRON & RAILWAY.—A bill has been introduced into the New Brunswick Legislature to incorporate this company, with a capital stock of \$190,000, to build a railroad from Moncton west 90 miles through the coal fields of the Grand Lake District in Queens County, to Fredericton. The company asks power to acquire the Central Railway and secure running powers over the railroad bridge at Fredericton. The provisional directors are: Right Honorable the Earl of Russell, William Leatham Bright, Bernard Charles Malloy, M. P., James Ward Burchill and Sir John H. Puleston, all of England.

NEW LONDON & HARTLAND.—This company was incorporated in Ohio, April 1, with a capital stock of \$10,000, to build a line from New London to a point on the east line of Hartland, all within Huron County. The incorporators are: C. W. French, C. D. Crouch, E. C. Hurd, V. A. Dehnel and C. E. Kaylor.

NORTHERN PACIFIC.—Location has been filed for the Clearwater extension from Stites, Idaho, east 18 miles to the mouth of Three-Mile Creek, and thence up the creek to Camas Prairie, within two miles of Grangeville. The road was completed to Stites last year.

NORWOOD & ST. LAWRENCE.—This company was incorporated in New York, March 30, with a capital of \$75,000, to build a standard gage line from Norwood to Raymondsburg, St. Lawrence County, 7½ miles. The directors are: Charles R. Remington, Alfred D. Remington, Charles H. Remington, George B. Kemp, Francis N. Hugo, Frank N. Hines, Charles M. Rexford and Warren H. Howe, of Watertown, and Orrin E. Martin, of Norwood.

NORFOLK & WESTERN.—An officer writes that the company is building an extension along Crane Creek, Va., to reach coal deposits. The line runs from Duhring up the valley of Crane Creek, six miles. The contractors are: J. T. McKinney, Lynchburg, Va.; Walton, Witten & Graham, Graham, Va., and Purcell, Moorman & Co., Lynchburg, Va.

OREGON SHORT LINE.—A contract is reported let with the White Knob Copper Co., Ltd., for building the proposed branch from Blackfoot, Idaho, northwest about 96 miles to Houston. (March 22, p. 210.)

The United Construction Co., of Ogden, Utah, is reported to have taken contracts for about \$250,000 in improvements for this company during the coming summer.

PANHANDLE & GULF.—An amended charter has been filed in Texas for this company, which is the Texas corporation of the Kansas City, Mexico & Orient, whereby the main line is to run from a point on the Red River in Wilbarger County south through Spofford, about 500 miles to the Rio Grande border in Presidio or Brewster counties, with a branch from San Angelo southwest about 450 miles to Brownsville near the mouth of the Rio Grande. (Construction Supplement, March 8, 1901.)

PENNSYLVANIA.—Bids are asked for the first three sections of work on elevating the company's track through Newark, N. J. (March 15, p. 194.)

PITTSBURGH & CARNEGIE.—This company, noted last week (p. 230), was incorporated in Pennsylvania, Feb. 4, with a capital stock of \$50,000, to build a railroad from a point in the city of Pittsburgh to a point in or near the Borough of Carnegie. The incorporators are: A. D. Neeld (President), Allegheny, Pa.; J. W. Patterson, Pittsburgh, Pa.; A. M. Neeler, Pittsburgh, Pa.; E. E. Jones, Williamsburg, Pa.

PORTLAND & RUMFORD FALLS.—Surveys are to be begun soon for a proposed extension of the Rumford Falls & Rangeley Lakes north to Indian Rock on Rangeley Lake, Me.

PORTLAND STREET.—Building is to be begun soon, according to report, on an extension of this electric line from Portland, Me., west to Scarborough and Gorham.

QUEEN CHARLOTTE ISLANDS.—M. King and John

Irving, of Victoria, B. C., have petitioned the Legislative Assembly of British Columbia for power to build a line from a point on Reynolds Sound, Graham Island; thence to a point at or near Skidegate Harbor, on Graham Island, Queen Charlotte Islands group; with power to build branch lines to any points in Queen Charlotte Islands.

ST. LOUIS VALLEY.—This company was incorporated in Illinois March 25, with a capital stock of \$50,000, to build a railroad from East St. Louis south to Cairo. The principal office is East St. Louis. The incorporators and first board of directors are: W. S. Forman, William R. Sackett, and L. M. Jeffries, of East St. Louis, and J. M. Shelton and F. V. Dubrouillet, of St. Louis, Mo.

SABINE PASS & NORTHWESTERN.—In addition to the matter noted two weeks ago (p. 210), an officer writes that the estimated cost of construction is \$10,500 per mile. The capital stock will be only \$400,000. There will be an issue of 5 per cent, first mortgage 30-year gold bonds at the rate of \$20,000 per mile. The surplus after building and equipment will be held by the Trust Company to insure interest on bonds and create a fund for redemption.

SANTA FE, ALBUQUERQUE & PACIFIC.—Locating surveys are reported completed for this proposed new line from Albuquerque, N. Mex., to run northeast 74.6 miles to Santa Fe. The heaviest work will be through Tyeras Canyon, requiring a maximum grade of 3 per cent, for about 3,000 ft., and a total rise of 1,000 ft. in 22 miles. W. S. Hopewell, of Hillsboro, N. Mex., is Vice-President and A. G. Kennedy, Chief Engineer. (Construction Supplement, March 8, 1901.)

SOUTHERN PACIFIC.—Arrangements are being made, according to report, for building a branch three miles long from Saulsbury, on the main line in California, to Fair Oaks.

SOUTHERN.—Surveys are reported in progress for new switch yards at Lonsdale, Tenn.

TENNESSEE CENTRAL.—See Nashville, Chattanooga & St. Louis in Railroad News column.

TEXAS NORTHERN.—Dr. B. F. Johnston, of Anderson, Tex., one of the promoters of this proposed line, has returned from St. Louis and other points with the announcement that satisfactory arrangements have been made for the rails and equipment, and the people of the city have appointed a committee to complete the organization of the company. The road is projected from Madison, Tex., south 67 miles via Anderson and Stoneham to Waller. T. C. Buffington, of Anderson, is Vice-President. (Construction Supplement, March 8, 1901.)

WATERVILLE & FARMINGTON.—The Maine Legislature has granted a charter to this company which proposes to take over the Wiscasset & Quebec, the Waterville & Wiscasset and the Franklin, Somerset & Kennebec and to build extensions. Money will be raised, it is said, to build the link between Weeks's Mills and Waterville, 11 miles. Frederick C. Thayer, of Waterville, Me., and Alfred P. Farley, of Wiscasset, Que., are interested. (Construction Supplement, March 8, 1901.)

WHITE PASS & YUKON.—The company has decided to build this season its contemplated extension to the White Horse mines, seven miles. (Construction Supplement, March 8, 1901.)

GENERAL RAILROAD NEWS.

AURORA STREET.—A Cleveland syndicate is arranging to buy this property in connection with the Aurora & Geneva Electric and the Aurora, Wheaton & Chicago and to connect the lines. Right of way for the proposed connection, which is about 40 miles long, has been obtained and about 20 miles is graded under the Aurora, Wheaton & Chicago.

CHESAPEAKE & OHIO.—The New York Stock Exchange has listed \$2,000,000 4 per cent, first mortgage gold bonds of the Greenbrier Ry. Co., covering 96 miles of new line, from the main road at Whitcomb Station, W. Va., to a point near the forks of the Greenbrier River. The line has just been completed. (Sept. 28, 1900, p. 644.)

DAVENPORT, ROCK ISLAND & NORTHWESTERN.—The Chicago, Milwaukee & St. Paul and the Chicago, Burlington & Quincy have entered into a 999-year traffic agreement with this company to operate trains over its tracks between Davenport and Clinton, 35.5 miles. The Burlington will operate its Clinton-St. Louis trains over this line instead of through Denrock and Barstow, Ill., as heretofore, saving 12 miles. The Milwaukee will use the line in connection with the cut-off which it is now preparing to build from Davenport, Iowa, to Ottumwa, making a saving of over 40 miles from Chicago to Kansas City. The agreement went into effect April 1.

DENVER & RIO GRANDE.—Notice is given to holders of preferred and common stock that a special meeting is to be held at the company's office at Denver, Colo., on May 15 at 2 p. m., to submit to a vote the purchase of the Rio Grande Western and to provide funds for the same. It is proposed to cancel the D. & R. G. stock now in the treasury, comprising \$4,350,000 preferred and \$7,500,000 common, which was reserved for acquiring the R. G. W. and to increase the D. & R. G. preferred stock from \$23,650,000 to \$44,400,000. The preferred stockholders will also be asked to assent to an issue of \$6,900,000 consolidated mortgage bonds for acquiring the Denver & Rio Grande Western or for extending the line of the company to Ogden.

Subject to the authorization of the proposed increase, \$12,500,000 of the new preferred stock will be offered at 90 to such of the company's stockholders as are on the transfer books, April 15, at the rate of one share of the new preferred for every five shares common or preferred held. The right to such purchase will terminate at 3 p. m., May 1, and payments must be made of \$20 per share at the time of application and the remainder on May 20. See also Rio Grande Western.

DETROIT & LIMA NORTHERN.—At Toledo, Ohio, on March 27, Judge Wing of the U. S. Court ordered the foreclosure sale of this property. F. J. Lismann & Co., as already noted, have arranged to acquire this line and the Ohio Southern under the plan recently announced. The sale is to take place in about 60 days and a new company is to be organized to be known as the Detroit Southern. (March 8, p. 178.)

DETROIT & TOLEDO SHORE LINE.—W. B. Strang, of Toledo, Ohio, has taken over the control of this property and proposes to build it as soon as the weather permits. Grading is reported completed for 17 miles and right of way purchased for 20 miles and five miles of track laid. The road when completed will connect Toledo with Detroit. (Construction Supplement, March 8, p. 1901.)

ERIE.—Richard Pine-Coffin has made application for a new trial before Justice Andrews in the Supreme Court, New York, on the decision for application restraining the Erie from carrying out its agreement with the Pennsylvania Coal Co. (March 1, p. 152.)

GULF & SHIP ISLAND.—Mr. J. T. Jones, of Buffalo, N. Y., President, has bought the interests of S. S. Bullis, Vice-President and General Manager, and those of W. B. Bell, Treasurer, making Mr. Jones sole owner. It is reported that the transfer is preparatory to the absorption of the property by another company.

KANSAS CITY, FORT SCOTT & MEMPHIS.—Nathaniel Thayer and Chas. Merriam, of 50 State street, Boston, Mass., give notice to security holders of their company and the Kansas City, Memphis & Birmingham that they have entered into an agreement to sell the stocks on the following terms: K. C., F. S. & M. preferred stock at \$150 per share, over 70 per cent, already deposited; common stock at \$100, over 80 per cent, deposited; K. C., M. & B. common stock at \$50, over 75 per cent, deposited. By the terms of the agreement the purchasers are required to take all other stock to be delivered by them at the same price, and holders who wish to take advantage of the offer are requested to make immediate deposits of their certificates with the Old Colony Trust Co., Boston, and prior to May 1 at 3 p. m. The sale is to be carried into effect on May 15. Holders of K. C., F. S. & M. common stock who do not so deposit will receive only \$75 per share in cash. (March 8, p. 178.)

KENTUCKY WESTERN.—The Wm. C. Thompson Co., of Chicago, is offering \$200,000 first mortgage 6 per cent, gold bonds, dated Jan. 1, 1900, at 98 and interest. The road was recently completed from Blackfoot, Ky., to Dixon, 21 miles.

LOUISVILLE & NASHVILLE.—Cecilian branch bonds to the par value of \$55,000 are redeemable at the Union Trust Co., at par and interest, after Sept. 1.

MEXICAN CENTRAL.—W. L. Stow & Co., New York, have acquired in the open market a majority of the capital stock of this company for a New York syndicate. The road, so it is said, is to be taken over in the interest of one of the railroads of the Southwest.

MEXICAN NATIONAL.—Holders of second mortgage A bonds will receive 4½ per cent. from the earnings of 1899, on account of past due interest, upon presentation of coupons 7 and 8 at the National City Bank, New York, April 23.

NASHVILLE, CHATTANOOGA & ST. LOUIS.—Jere Baxter, President of the Tennessee Central, is quoted as stating that he has closed a lease for the Lebanon Branch of the N. C. & St. L., from Nashville, Tenn., east 29.21 miles to Lebanon, and the line will be completed into Harriman.

NEW BRUNSWICK SOUTH SHORE.—A bill has been agreed to in the New Brunswick Legislature to incorporate this company to take over the Shore Line. The company also proposes to improve the road and connect it with the St. John Bridge, giving entry into the city of St. John proper instead of the West End.

NEW YORK, NEW HAVEN & HARTFORD.—Kidder, Peabody & Co., of Boston, have sold \$5,000,000 of this company's 3½ per cent, bonds, due March 1, 1947-9. This issue is understood to be the unsold balance of the \$10,000,000 non-convertible debentures authorized in 1897.

PENNSYLVANIA.—Stockholders of record April 26 are offered the right to subscribe to \$50,567,000 of new stock at \$60 for each \$50 share to the amount of one-third of their holdings. The proceeds will be used to satisfy the collateral investment obligations of the company for building and equipment, and for other corporate purposes. The new issue will raise the outstanding stock to \$202,267,000. (March 15, p. 194.)

RIO GRANDE WESTERN.—At a meeting of the Board of Directors of the Denver & Rio Grande, held March 29, resolutions were adopted authorizing the acquisition of the Rio Grande Western. The two lines are connected at Grand Junction, Colo., by a short road operated by men who hold interests in both companies. (March 22, p. 210.)

Spencer Trask & Co., New York, give notice to stockholders that in behalf of holders of more than 90 per cent, of common stock, they have negotiated with representatives of the Denver & Rio Grande the sale of the stock, subject to ratification by the purchasing company. All the outstanding common stock is included in the offer and holders who have not already deposited are advised to do so prior to April 30. The allotted price of the common stock is \$80 per share, with 4 per cent, interest from Jan. 1, 1901, to date of payment, less commission of \$5 per share for transacting the business. By the terms of the sale, Spencer Trask & Co. undertake to procure for preferred stockholders of the R. G. W. the option for a reasonable period to exchange their shares for preferred stock of the D. & R. G., at the rate of 10 shares of the Western for 11 shares of the Denver stock. They expect to make such exchange of their own holdings of preferred stock and recommend the same to their clients.

SEATTLE & SAN FRANCISCO RAILWAY & NAVIGATION.—Coupons on the first mortgage 5 per cent, gold bonds of the company, due April 1, will be paid after that date at the Metropolitan Trust Co., New York.

TOLEDO & OHIO CENTRAL.—The company has issued \$500,000 first mortgage 4s on the St. Mary's Division, due Feb. 1, 1951, to the Central Trust Co., trustee; also \$500,000 first preference income 4s, due at the same date, to the Standard Trust Co., trustee.

ULSTER & DELAWARE.—The Farmers' Loan & Trust Co. has been made trustee under the second mortgage of May 1, 1899, succeeding the Central Trust Co., resigned.

VICKSBURG, SHREVEPORT & PACIFIC.—This property was sold under foreclosure at Monroe, La., March 30, to H. H. Hall, of New Orleans, representing the first mortgage bondholders, for \$1,500,000. Under the reorganization to follow foreclosure sale a new company is to be formed with \$3,000,000 common stock and \$2,200,000 preferred 5 per cent, non-cumulative stock; also \$3,500,000 5 per cent, general mortgage 25-year gold bonds. Of the bonds, \$1,323,000 is to be held in reserve for prior liens, and \$2,070,000 for cash contributions and for future requirements. Holders of old first mortgage bonds are to receive 40 per cent, in common stock, 30 per cent, in preferred and 20 per cent, in bonds. (March 1, p. 152.)

WHEELING & LAKE ERIE.—The New York Stock Exchange has listed \$1,529,000 additional 4 per cent, consolidated bonds; \$40,000 additional first preferred and \$20,000 second preferred stock. Of the additional bonds \$286,000 has been used in buying the railroad from Coshocton, Ohio, to Zanesville, 29.9 miles.